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ABSTRACT

This publication is the second volume of teaching activities in environmental education designed for student use in grades K-12. Each activity has been classified by the editors according to the most appropriate grade level, subject matter, environmental concept involved, and environmental problem area. Subject areas are science, mathematics, social studies, language arts, and fine arts; the concepts include biophysical, sociocultural, management, and change-oriented concepts. The other classification, environmental problem areas, includes aesthetic considerations, eco-community relationships, and psychological and behavioral considerations. In addition to being classified in these four categories, each activity contains a statement of purpose on how the activity may be used and a reference to a source where the activity may be found in more detail or with variations. (Authors/TK)

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ERIC/SMEAC presents

TEACHING ACTIVITIES IN ENVIRONMENTAL EDUCATION

Volume II - 1974

Selected and edited by

John H. Wheatley
Herbert L. Coon

SE 018 803

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ENVIRONMENTAL EDUCATION INFORMATION REPORTS

Environmental Education Information Reports are issued to analyze and summarize information related to the teaching and learning of environmental education. It is hoped that these reviews will provide information for personnel involved in development, ideas for teachers, and indications of trends in environmental education.

Your comments and suggestions for this series are invited.

John F. Disinger
Associate Director
Environmental Education

Sponsored by the Educational Resources Information Center of the National Institute of Education and The Ohio State University.

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INTRODUCTION

This publication is the second volume of teaching activities in environmental education designed for student use in grade K through 12. Each activity has been classified by the editors according to the most appropriate grade level, subject matter, environmental concept involved, and environmental problem area; the classification systems are given below and on the following pages. In addition to being classified in these four categories, each activity contains 1) a statement of purpose on how the activity may be used, and 2) a reference to a source where the activity may be found in more detail or with variations.

It is hoped that the teachers who use these materials will recognize that the classified categories and statement of purpose serve only as a guide in selecting appropriate activities and should not be considered a fixed structure.

CLASSIFICATION OF ENVIRONMENTAL EDUCATION ACTIVITIES

GRADE LEVEL: K - 3

4 - 6

7 - 9

10 - 12

SUBJECT AREA:	Science	-including health, nature studies, etc.
	Mathematics	-including arithmetic, geometry, etc.
	Social Studies	-including geography, population, history, etc.
	Language Arts	-including reading, creative writing, etc.
	Fine Arts	-including music, art, theater, etc.

BREAKDOWN OF ACTIVITIES BY CATEGORY

(Some activities fall into more than one category in each area.)

	Category	Number of Activities
Grade Level:	K - 3	28
	4 - 6	45
	7 - 9	52
	10 - 12	43
Subject Area:	Science	92
	Mathematics	22
	Social Studies	90
	Language Arts	18
	Fine Arts	18
Concepts:	Bio-physical	41
	Socio-cultural	32
	Management	15
	Change	17
Problem Area:	Aesthetics	14
	Health	9
	Genetics	3
	Eco-Community Relationships	69
	Psychological/Behavioral	14

PROBLEM AREA CLASSIFICATION

modified from Brubaker, Sterling. To Live on Earth. Baltimore:
The Johns Hopkins Press, 1972.

I. AESTHETIC CONSIDERATIONS

1. odor
2. air particulate matter - visibility, irritation
3. visual pollution - signs, power lines, billboards, buildings
4. litter
5. noise
6. water quality - taste, odor
7. open spaces - urban and rural
8. city planning and convenience
9. traffic control
10. cultural opportunity
11. recreational facilities

II. HEALTH CONSIDERATIONS

1. disease control - breeding ground control
2. radioactivity
3. air quality - harmful effects (pathogens, chemicals)
4. water quality - harmful effects (pathogens, chemicals)
5. food quality - pesticides, additives
6. medical treatment

III. GENETIC CONSIDERATIONS

1. radioactivity
2. chemicals - air, water, food
3. medical treatment

IV. ECO-COMMUNITY RELATIONSHIPS

1. ecological considerations
2. land use
3. natural resource use
4. energy production
5. urban planning
6. population studies
7. species control (non-human)
8. weather
9. fertilizers and pesticides
10. effects of air quality on ecosystem
11. effects of water quality on ecosystem
12. effects of humans on ecosystems

V. PSYCHOLOGICAL AND BEHAVIORAL CONSIDERATIONS

1. crowding
2. social aspects
3. cultural considerations

CONCEPTS IN ENVIRONMENTAL EDUCATION

from Bowman, Mary Lynne Cox. The Development and Field Validation of an Instrument to Assess College Students' Attitudes Toward the Determinants of Environmental Issues. Unpublished doctoral dissertation, The Ohio State University, Columbus, Ohio, 1972.

I. BIO-PHYSICAL

1. Living things are interdependent with one another and their environment.
2. Green plants are the ultimate sources of food, clothing, shelter, and energy in most societies.
3. An organism is the product of its heredity and environment.
4. In any environment, one component--like space, water, air, or food--may become a limiting factor.
5. The natural environment is irreplaceable.

II. SOCIO-CULTURAL

1. The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.
2. The relationships between man and the natural environment are mediated by his culture.
3. Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

III. MANAGEMENT

1. The management of natural resources to meet the needs of successive generations demands long-range planning.
2. Family planning and the limiting of family also are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.
3. Environmental management involves the application of knowledge from many different disciplines.
4. Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

IV. CHANGE

1. Organisms and environments are in constant change.
2. The rate of change in an environment may exceed the rate of organism adaptation.
3. All living things, including man, are continually evolving.
4. Man has been a factor affecting plant and animal succession and environmental processes.
5. Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

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	Activities	Pages
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Science	9	1
Science-Social Studies	1	
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Language Arts	3	
Language Arts-Science	1	
Fine Arts	5	
Fine Arts-Science	2	
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Science-Social Studies	2	
Science-Language Arts	1	
Mathematics-Science	2	
Mathematics-Social Studies	2	
Social Studies	5	
Social Studies-Science	6	
Language Arts	3	
Fine Arts	5	
Fine Arts-Science	2	
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Science-Mathematics	3	
Science-Social Studies	5	
Science-Language Arts	1	
Mathematics-Science	1	
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Language Arts	3	
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Science-Mathematics	1	
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Science-Language Arts	1	

	Activities	Pages
Grade Level 10-12 (cont'd.)		
Mathematics-Social Studies	2	
Social Studies	15	
Social Studies-Science	9	
Social Studies-Mathematics	[illegible]	
Social Studies-Mathematics-Science	1	
Language Arts	3	
Language Arts-Social Studies	1	
Fine Arts	1	

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GRADE LEVEL K-3

Activities	
Science	9
Science-Social Studies	1
Science-Language Arts	1
Mathematics	2
Social Studies	3
Social Studies-Science	1
Language Arts	3
Language Arts-Science	1
Fine Arts	5
Fine Arts-Science	2

PURPOSE: To learn about animal adaptations.

LEVEL: K-3

SUBJECT: Science

CONCEPT: I-3 An organism is the product of its heredity and environment.

PROBLEM: IV-7 Eco-Community Relationships--species control (non-human).

REFERENCE: Environmental Learning Experiences for Kindergarten Through Second Grade. Center for the Development of Environmental Curriculum, Willoughby-Eastlake City Schools, Willoughby, Ohio. Ohio Department of Education, Columbus, Ohio, 1973.

ACTIVITY: Arrange to have a kitten brought into the classroom. Prior to the visit discuss with the children how they think pets in general, and kittens particularly, should be treated.

Have the children form a large circle, lying on their stomachs with the kitten in the middle. Give the kitten some milk in a saucer and have the children observe how it laps milk. Have a child dip his finger in the milk and describe how it feels to have the kitten lick it off. Repeat with other children if possible. How does the kitten's tongue compare with a human tongue? Can they think of other animals that have "special ways" of drinking?

Examine the kitten's feet and show how the claws can be extended or retracted. What is the use of such an arrangement? An interesting additional activity might be to get the kittens footprints with water color paint.

If possible darken the room and use a flashlight to see what happens to the kitten's eyes in darkness and in bright light. How are cats' eyes adapted to darkness? Why do they hunt at night?

Observe how the kitten uses his whiskers when the children try to coax him through a small opening. Does he like to have his whiskers touched?

The reference cited suggests several other questions that might be investigated if time and interest permit. Why do farms often have many cats? Are there "wild" cats? How do cats "talk" to each other?

The reference also poses the interesting idea that an initial visit by a kitten to a class might be followed by others in a sort of "animal of the month" program.

PURPOSE: To study animal life in the snow.

LEVEL: K-3
4-6

SUBJECT: Science

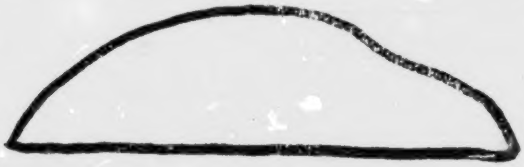
CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Nature's Bulletin Board Ideas," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: This activity is an informational game that can be played using the bulletin board. This game can be played as part of a unit on animal habitats during Winter conditions; variations of the game can be used for other units of study.

Cover your bulletin board in a Winter scene, including areas where animals can be found in the Winter--forest, field, stream, etc. Each student is to hide an animal behind a snowbank in the Winter scene; a snowbank is a piece of heavy white paper shaped like this:



Have the students secretly draw an animal (or paste a picture from a magazine) on the back side of the snowbank; on the front side, have the student place some clue as to what animal may be hidden behind the snowbank. These clues may be the tracks of the animal, a special type of food, or picture of the animal's nesting place, etc. Pin the snowbank onto the Winter scene with only the front side of the snowbank showing. Then, every day, have one or two students "melt" their snowbanks to reveal what animal was hiding there.

PURPOSE: To see how organisms have adapted for a particular environment.

LEVEL: K-3

SUBJECT: Science

CONCEPT: I-3 An organism is the product of its heredity and environment.
IV-3 All living things, including man, are continually evolving.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Elementary Science Guide," Division of Elementary Education, State Department of Education, Richmond, VA 23216.

ACTIVITY: Living things are adapted to their natural environment and may adapt to changes in the environment. Adaptation in structure and function has enabled organisms to meet life needs. Observation can be made of specialized body structures in animals for obtaining food, defense, reproduction, oxygen-carbon dioxide exchange, communication, and many more. The following activity suggests ways that structures for locomotion can be observed.

Specialized body structures enable animals to move from place to place. Visit a farm or zoo or look at pictures to observe and compare methods of locomotion in such animals as rabbit, horse, squirrel, bird, duck, fish, snake, ostrich, and so on.

Name the specialized body structure used by each of the animals in moving about; although several animals use the same body parts, how do these structires differ? Note how man has invented special "tools" resembling the specialized body parts of animals to aid in his locomotion, e.g. flippers for swimming, wings for airplanes, snowshoes. Make a chart or bulletin board to show the many types of locomotion.

Study the feet of different animals and discuss the specialized features in relation to the place the animal lives. The ostrich has broad feet for walking in sand; the duck has webbed feet for swimming; the dog's foot is all toes for running.

PURPOSE: To make insect cages.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Walnut Springs Interest Unit," Environmental Education Coordinator, State College Area School District, State College, PA

ACTIVITY: Insect cages can be made by students so that insects may be observed in the classroom. The materials needed are:

2 1-pound coffee can plastic lids
1 piece screen, 4" X 12"
plaster of paris

Roll the screen and fasten it with wire, string or staple to a cylinder 12 inches tall and 4 inches in diameter. Fill one coffee-can lid with a thick mixture of plaster of paris and set one end of the wire cylinder into it; allow this to harden and form the bottom of the insect cage. Cover the top of the cage with the second lid and fasten it on one side with wire or string to form a hinge. Now you have an insect cage.

PURPOSE: To show the effects of overcrowding.

LEVEL: K-3
4-6
7-9

SUBJECT: Science

CONCEPT: I-4 In any environment, one component--like space, water, air, or food--may become a limiting factor.

PROBLEM: IV-6 Eco-Community Relationships--population studies.

REFERENCE: Mary Rea, Dublin, Ohio, Middle School Teacher.

ACTIVITY: Divide the class into small groups. Each group should obtain or be given five flower pots or other small planting containers. The containers should be filled with soil from the same source and labeled A, B, C, D, and E. Plant in the containers widely differing numbers of one kind of seed such as radish, tomato, or corn. Geometric ratios such as the following might be used:

A = 2 seeds
B = 4 seeds
C = 8 seeds
D = 16 seeds
E = 32 seeds

Maintain all factors such as light, temperature, and moisture constant in all containers and make observations of growth that results during a period of 2-4 weeks.

What conclusions can be drawn about crowding and growth in plants? What does this mean to a gardener or farmer? Obviously, crowding affects plant growth. Does it also affect animal growth? How might it have the same results? How would it be different?

PURPOSE: To show how water is transported in plant tissue.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: I-2 Green plants are the ultimate sources of food, clothing, shelter, and energy in most societies.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Nature's Alphabet," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: This activity may be used to demonstrate the transportation of material within plants. After a study of roots and stems and their functions, introduce the concept of how food and water is moved throughout the plant.

Place a fresh celery stalk in a glass of water colored with food coloring. Very soon the colored water will be seen moving up tubes within the celery stalk. Allow the students to examine pieces of celery and especially the transportation tubes (vascular bundles).

Let the students try variations of the activity. Is the rate of water movement affected by light or heat? Split a celery part way up the stalk; place the split ends in containers,with different colored water, which are side-by-side.

PURPOSE: To illustrate plant transpiration.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: I-4 In any environment, one component - like space, water, air, or food - may become a limiting factor.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: Geology and Earth Sciences Sourcebook. Robert L. Heller, Editor, Holt, Rinehart and Winston, Inc., 1970.

ACTIVITY: Raise with the children questions about what happens to the water used to water plants such as geraniums and cacti that are kept in many elementary school classrooms. With their help plan an experiment to see if the weight of a plant and its container might change over a period of 24-48 hours.

Using two geraniums of roughly equal size water them appropriately. Enclose one geranium air tight in a clear plastic bag. Balance the two plants on a two pan scale and see if any difference in weight becomes apparent during the next two days. Which became lighter? Why? Was anything visible on the plastic bag? What actual change of weight occurred?

Repeat the experiment with two cacti. Did the same thing occur? Why or why not?

PURPOSE: To learn how soil is made.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-2 Eco-Community Relationships--land use.

ACTIVITY: This is a series of short activities to allow students to learn how soil is made through the interaction of rocks and environmental factors.

Scrape two rocks together; the dust formed is the beginning of soil. How do rocks "scrape together" in nature? Consider wind particles.

Allow water ro run across a rock surface or to drip on a rock for a week. Placing rocks in a stream or studying the rocks already there would be a similar activity. Talk about the effects of rain and erosion.

Wrap a rock in foil or put it in a sack of some sort and place the rock in the freezer for several days. (The foil or sack prevents dirt from getting on other things in the freezer.) Observe any changes in the rock. Allow the rock to warm to room temperature and repeat the process. How does the freezing occur in nature?

Obtain two gallon jars and fill them with alternating layers of dark soil and sand approximately one-inch thick. Place several earthworms in one jar and label the jar. Cover both jars with black paper to prevent light from shining on the sides of the soil. After several days, remove the paper and observe the difference between the two soils. Earthworms make tunnels in the soil which allow air and rain to penetrate deeper into the soil. How does this affect the soil or the plants and animals in (or on) the soil?

PURPOSE: To learn how to use and manage solar energy.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.
III-3 Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: IV-4 Eco-Community Relationships--energy production.

REFERENCE: "Living Within Our Means: Energy and Scarcity," Environmental Education Instructional Activities K-6, State Department of Education, Albany, NY 12224.

ACTIVITY: On a sunny day in early Spring, take the class into a room on the sunny (south) side of the school building. Then go into a room on the shaded (north) side of the building. Ask the children if the air temperature in the two rooms felt different. Elicit that the first room felt warmer and that the sun has warmed it.

Ask which side of the school usually gets the most sun. If the children cannot remember, take the class outside at different times on a sunny day. They will probably discover that one side (south) gets the most sun while one other side (north) gets less. Explain that the side facing the sun should have many large windows to take advantage of the sun's warmth and that the opposite side of the building should have fewer windows.

Encourage the children to plan and build several diorama "houses" which would utilize the sun's warmth for heating. Place the completed houses on the window ledge in a sunny room. Discuss with the children how the houses should be oriented. To test their hypothesis, several houses should have the big windows facing away from the sun. Place small dishes of water in each of the model houses. After several hours, have the children test the temperature of the water with a lab thermometer.

-- In which of the model houses would the children expect to have the water feel warmer? Why?
-- If real houses were built with many windows facing the sun, how would that affect the amount of fuel necessary to heat them?
-- What problem might occur in the Summer?
-- How could this problem be prevented?

PURPOSE: To identify sounds on a hike around the school yard.

LEVEL: K-3
4-6

SUBJECT: Science
Social Studies

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM IV-1 Eco-Community Relationships--ecological considerations.
I-5 Aesthetic Considerations--noise.

REFERENCE: "Some 'Around the School Yard' Activities," U.S. Forest Service, Portland, Oregon.

ACTIVITY: Take the students on a "sound" hike around the school yard. Stopping at intervals along the way, have the students sit quietly and close their eyes for 30 seconds. At the end of the 30 seconds, have each student describe a sound he heard. The teacher should write down the way each student describes his sound. Can the sound be identified? Stop at many different places so there will be a variety of sounds to be heard.

After the hike, try to decide which sounds were natural and which were man-made; which sounds were loudest and which were quietest; which were highest in pitch and which were lowest; which were the most pleasant to hear and which were the most unpleasant. Are the man-made sounds the most plentiful? Would the sounds be different in a rural area? Is man causing a problem with too loud sounds?

PURPOSE: To observe the Winter season out-of-doors.

LEVEL: K-3

SUBJECT: Science
Language Arts

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Environmental Curricular Materials - Level I," State Department of Public Instruction, Dover, Delaware 19901.

ACTIVITY: Have the students dress warmly and take them on a field trip around the school building. The purpose of the trip is to discover how organisms change to face the winter season. There are many sites that may be visited:

Trees--How are the trees different in the winter than in the summer? How would you describe them? Can you tell the difference between one tree and another? Do all trees have the same shape? Are there any trees with the leaves still on? How do these leaves (needles or leathery leaves) differ from the other trees? Are there any homes for other organisms in the tree such as insect galls, bird nests, holes in trunk? Do other organisms besides animals live on the tree (moss, fungi, algae)?

Field--Do you see any animals in the field? What grows in the field? Are all the plants alike? Is there food for animals in the field? What kinds of animals might feed here? Would it be easier for animals to see and be seen in the field or in the woods? Are there any evidences of animals present such as tracks, droppings, feeding stations?

Creek or Pond--Is there any "running" water? What causes the water to "run?" Is it "running" faster now or in the summer? Is the water clear or muddy? Why? What do you see in the bottom of the water? Would you expect to find animals living in the water? Would the animals be different in a pond or a creek?

Following the field trip, students should share the things they found by telling stories about what they saw.

PURPOSE: To use nature as a study aid for math problems.

LEVEL: K-3

SUBJECT: Mathematics

CONCEPT: I Bio-Physical

PROBLEM: IV Eco-Community Relationships

REFERENCE: "Nature's Alphabet." Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016

ACTIVITY: Children need to work with concrete objects in working with math problems. This activity is designed to help introduce or review math. By gathering objects on a field trip, the students can work math problems assigned to them or make up problems of their own.

This activity can easily be accomplished on the school grounds. Divide the class into working groups, giving each group some problem cards to complete. Explain to the class that they must find the correct objects to complete their cards. The math problem cards may be set up in several ways:

2 GREEN + 4 GREEN = ____________

The students must find the right number of the proper objects and provide the correct total.

________ STONES + ________ STONES = ______________

The students may find any number of the proper object and give a total.

2 RED ________ + 6 GREEN ________ = ______________

The student must find the proper number of any object which fits the description and provide the total.

After returning to the classroom, paste the object in the correct places if possible. Leftover materials may be used to make either individual or group math cards. Let the students use their own imagination.

PURPOSE: To understand sets using animal pictures.

LEVEL: K-3

SUBJECT: Mathematics

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Living Within Our Means: Energy and Scarcity," Environmental Education Instructional Activities K-6, State Department of Education, Albany, NY 12224.

ACTIVITY: Have each child bring in two or three magazines that his family has finished reading. Then, have the students cut out all of the animal pictures by using the following categories on a bulletin board:

-- animals with feathers
-- animals with fur
-- animals with scales
-- animals with shells

When the bulletin board has been completed with animal pictures, discuss set theory using questions such as the following:

-- Which set has the greatest number of pictures?
-- Which set has the least?
-- How many more pictures are in the largest set than are in the smallest?
-- Are there any sets with the same number?
-- Can you think of any other ways in which to group animals?

(Grouping by habitat or by extinct-nonextinct-endangered species are some other possible groupings.)

Choose an animal from each set and explain how it is useful to man.

Are any of these useful animals in danger today? What can be done to protect them?

A similar activity can be developed using plants. When the class is finished with the magazines, contribute them to a local paper drive.

PURPOSE: To discover how "waste" materials are made useful.

LEVEL: K-3
4-6
7-9

SUBJECT: Social Studies

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

REFERENCE: "A Supplementary Program for Environmental Education--Social Studies," Project I-C-E, 1927 Main Street, Green Bay, WI 54301.

ACTIVITY: This is a study of how items that were once considered to be waste materials are now products in demand. The activities should be generated by the class through the teacher's guidance.

As the class winds up a project and begins to dispose of the material gathered for the project, begin a discussion on what happens to waste material and how can it become a useful material again.

While discarding waste paper, begin a discussion of paper recycling. Visit a print shop and a recycling center. Try to determine how much paper is thrown away in a day in your class, in your school. Calculate this in terms of dollars and cents. How much does it "cost" to recycle paper.

The study of sawdust is a fun unit. Sawdust was once a waste product but is now in demand for sweeping compounds, particle board, paper manufacture, and other products. A trip to a sawmill might be of interest here.

PURPOSE: To learn the difference between "needs" and "wants."

LEVEL: K-3

SUBJECT: Social Studies

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: V-3 Psychological and Behavioral Considerations--cultural considerations.

REFERENCE: "Living Within Our Means: Energy and Scarcity," Environmental Education Instructional Activities K-6, State Department of Education, Albany, NY 12224.

ACTIVITY: Man, like other animals, has certain basic needs which must be met if he is to survive. Beyond these, the things that he acquires and uses reflect his wants and desires. Have the children either draw or cut out pictures of "Things We All (Really) Need" and "Things We Would Like To Have." Assemble the pictures according to these two categories and display them.

-- Which pictures or drawings show things that all boys and girls everywhere in the world need?
-- Why does everyone need them?
-- Are there some things that people in the United States really need that other people in the world do not? Explain.
-- How does the size of a country's population affect how well their needs are taken care of?

Have the children examine the second group of pictures, those things which they would like to have (nonessential or luxury items). Determine whether children have essentially the same wants.

-- Why are there differences in the things you want?
-- Can we get all of the things we want all of the time? Why, or why not?
-- Why is sharing important and necessary?
-- What are some rules you would make to insure that everyone got his "fair share?" What do we mean by "fair share?"
-- Using things that we do or things we have in the classroom as examples, show how sharing can benefit everyone and satisfy many of our needs.

PURPOSE: To make children aware that they must protect themselves from some parts of their environment in order to stay healthy.

LEVEL: K-3

SUBJECT: Social Studies

CONCEPT: IV-4 Man has been a factor affecting plant and animal succession and environmental processes.

PROBLEM: II Health Considerations.

ACTIVITY: Have the students describe (or draw pictures) of the many environments where they work and play. Ask them to tell how the environment affects them in such things as noise, weather, sun, germs, water, air, hard surfaces on the ground, etc.

Discuss why it is necessary to have rules and regulations about behavior in the environment; why you have to wait your turn; respect the property of others; not hurt others.

Have the students tell how they affect the environment; noise, moving parts of the environment about, planting trees, leaving litter.

Ask the children to think what would happen if the waste baskets were never emptied. What does actually happen to the paper that is thrown away each day? How many kinds of people are involved in disposing of the trash?

Have the students make illustrated booklets showing the responsible things one does to help make his community a safe, healthful, and pleasant place to live.

PURPOSE: To experience good and poor planning and decision making.

LEVEL: K-3

SUBJECT: Social Studies
Science

CONCEPT: III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

REFERENCE: "A Supplementary Program for Environmental Education--Language Arts," Project I-C-E, 1927 Main Street, Green Bay, WI 54301.

ACTIVITY: Have students respond to the slogan "Save Today For Tomorrow."

Provide 10 crackers for each student in the class. Explain that those represent their cracker supply for one week, with two crackers for each day. Give the crackers to the students in a plastic bag with their name on it. Discuss what will happen if a student eats all his crackers in the first few days.

Daily, have a special cracker break and eat only those crackers which you have provided for the students.

Discuss management practices in terms of natural resources or food chains.

PURPOSE: To encourage better vocabulary usage.

LEVEL: K-3
4-6

SUBJECT: Language Arts

CONCEPT: II Socio-Cultural.

REFERENCE: "Nature's Bulletin Board Ideas," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: This activity is designed to introduce new vocabulary words and their usage through the visual display of a bulletin board.

Cover the bulletin board with a light-colored paper and, with a black felt pen, sketch a large spider's web that covers the whole board, perhaps adding a spider in one corner. Label the bulletin board "Weave A Web Of Words." On strips of light-colored paper (but different from the background of the bulletin board) print new words which you want or expect the students to know. Tack these words to the web at various points. As new vocabulary words are introduced, more words may be added to the web or others removed. Following a field trip, the students may have words of their own to add to the bulletin board. You may want to put up words that the students should include in a story or a report.

PURPOSE: To develop a positive attitude about changing the environment.

LEVEL: K-3

SUBJECT: Language Arts

CONCEPT: III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: IV Eco-Community Relationships

REFERENCE: "Living Within Our Means: Energy and Scarcity," Environmental Education Instructional Activities K-6, State Department of Education, Albany, NY 12224.

ACTIVITY: Using grammar exercises is a part of the development of any language skill; these exercises can be opportunities to use words with environmental significance. As a part of the exercise, the meaning of the sentence in terms of the environment can be discussed while working with the students on sentence structure. Some examples are:

The (dead) leaves fell.

When do leaves fall?
What happens to the leaves after that?

The air in the city is (dirty) .

What causes the air to be this way?
Is anything being done about it?

Cars are too (big) .

How do we know this?
Is your family car too big?
Is it always full?
What are the advantages of small cars?

PURPOSE: To develop ecological awareness through literature.

LEVEL: K-3
4-6

SUBJECT: Language Arts

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Living Within Our Means: Energy and Scarcity," Environmental Education Instructional Activities K-6, State Department of Education, Albany, NY 12224.

ACTIVITY: Many stories and books on nature, ecology, and the environment are available in libraries today. These books may be used and serve as springboards for discussion of the environment.

Some possible literature to use is:

Noah's Ark by Gail E. Haley

Who Killed Cock Robin? by Jean George

The Wasp World by Bill Peet

The Dead Tree by Alvin Tresselt

Lives of an Oak Tree by Ross E. Hutchins

Lookout for the Forest by Glenn O. Blough

My Side of the Mountain by Jean George

Let's Look Under the City by Herman & Nina Schneider

Gay-neck, The Story of a Pigeon by Dhan Gopal Mukerji

PURPOSE: To describe a fungus on a log.

LEVEL: K-3

SUBJECT: Language Arts
Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Environmental Curricular Materials - Level I," State Department of Public Instruction, Dover, Delaware 19901.

ACTIVITY: When asked to give some words describing an object in nature, the student should include the use of all senses--sight, smell, touch, hearing, and taste.

Draw attention to fungal growth on a fallen tree or on the side of a living tree. Have the students consider the following:

What does the fungus look like? What color is it? What size? Are there several fungi? Are they all alike? Does one side look different from the other?

Feel the growth. Is it rough or smooth? Wet or dry? (Try squeezing a piece of the fungus.) Soft or hard?

Smell a piece of the fungus, but caution your students about breathing in spores if the fungus has matured. Describe the smell. Can you think of anything that has a similar smell? (Rich, moist dirt probably has fungus growing in it; decaying bread has fungus living on it.)

Do not have the students taste the fungus unless you are sure it it not harmful.

PURPOSE: To sense the influence of different types of sounds.

LEVEL: K-3
4-6

SUBJECT: Fine Arts

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: I-5 Aesthetic Considerations--noise.

REFERENCE: Environmental Pollution Education - Curriculum Resource Guide. St. Joseph's Calumet College, East Chicago, Indiana.

ACTIVITY: Have paint or crayons and paper ready for use by each child. Play a recording of soft, beautiful music and ask each child to relax and listen to it with eyes closed. Ask children to paint or draw what they felt or "saw" as they listened to the music.

The next day, repeat the art activity but this time play a strident, raucous recording that might include sounds similar to "noise" heard on typical city streets. Again ask children to express their feelings through drawing or painting.

In comparing their drawings and feelings, which kind did they like better? Why? When is "noise" O.K. or even desirable? What kinds of sound do they prefer for different purposes? What responsibility should they and their siblings assume for making "good" or "bad" sounds?

PURPOSE: To become more aware of beauty in the world.

LEVEL: K-3
4-6

SUBJECT: Fine Art

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and life-ways that are transmitted to its progeny.

PROBLEM: V-3 Psychological and Behavioral Considerations--cultural considerations

ACTIVITY: Suggest to the class that it would be nice if they could help make the classroom more attractive. Ask individual students to identify their "most beautiful thing." Responses will likely include such things as favorite animal pets, sunset, a brother or sister or parent, a flower, a toy, a mountain, and many other objects perceived as beautiful by children.

Arrange for two or three children, who agree that a certain thing is beautiful, to work together to prepare a collage or painting that can be displayed for some time in the classroom.

Ask the collage builders to share, with the class, their feelings about the objects included in their creative effort. Is their beauty created by man, nature, or both? What, if anything, must be done to maintain it? Is our world getting more beautiful or uglier? What evidence can they give? What can they do about it?

PURPOSE: To have individuals express their personal attitude toward pollution through creative art forms.

LEVEL:
K-3
4-6
7-9
10-12

SUBJECT: Fine Arts

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: I-10 Aesthetic Considerations--cultural opportunity.

REFERENCE: Hershey, John T. *et al*. *A Curriculum Activities Guide to Water Pollution and Environmental Studies*. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: This activity gives students a chance to become more aware of the environmental crisis through their art and pass this awareness to others. Students of all ages and all kinds of artistic abilities can participate.

The activity may be initiated by having the class visit a scene of actual pollution. There, and at other sites, the students may collect the trash or symbols of the pollution; some of these may be included in the actual making of the art form. Posters, collages, mobiles, sculptures, and other art forms may be used; creative dance, plays, and songs should also be considered. The art forms should be displayed in various areas of the school and community.

PURPOSE: To make collages or arrangements with dried flowers.

LEVEL: K-3

SUBJECT: Fine Arts

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: I-10 Aesthetic Considerations--cultural opportunity.

REFERENCE: "Walnut Springs Interest Unit," State College Area School District, Environmental Education Coordinator, State College, PA

ACTIVITY: On a field trip, collect flowers to be dried. Several methods can be used for drying the flowers.

Hanging Flowers Upside Down--Straw flowers and similar field flowers dry well simply by hanging a bunch upside down. Usually the earlier the flowers are picked, the better they hold their color.

Silica Gel--This is a commercially prepared sandy mixture used in drying flowers. You may also use a mixture of 1 cup dry sand to 1 tablespoon Borax. Place about 2 inches of Silica Gel in the bottom of a flat container that will seal tightly. Place flowers face up or down with stems cut to about 2 inches. Gently pour Gel over the flowers until covered. Seal the container and keep it in a warm, dry place. The flowers take from 3 days to 2 weeks to dry and will retain their deep colors.

Pressing in a Book--Flat flowers may be dried by placing them between two pieces of paper and pressing them in a heavy book. Flowers will retain their colors but will be flat.

Drying in the Field--Some flowers dry well in the field and may be used as they are found.

After preparing the dried flower specimens, have the students build collages on poster paper or make arrangements in containers.

PURPOSE: To make a creative bookmarker using natural materials.

LEVEL: K-3
4-6

SUBJECT: Fine Arts

CONCEPT: I Bio-Physical

PROBLEM: I Aesthetic Considerations

REFERENCE: "Nature's Art," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: For this activity you will need: pressed flowers, leaves, or similar dried materials; poster paper; and clear contact paper. The same procedure may be followed in constructing other art forms.

Cut the poster paper into the size bookmarker you want; cut the clear contact paper about 1/4 inch larger in all dimensions than the poster paper. Arrange the dried objects on the poster paper in the desired design; carefully cover the arrangement with the contact paper and fold the overlapping contact paper around the edges of the poster paper. Your nature bookmark is now ready for use. These would make good gift ideas.

PURPOSE:	To capture spider webs with spray paint.
LEVEL:	K-3 4-6
SUBJECT:	Fine Arts Science
CONCEPT:	I Bio-Physical
PROBLEM:	I Aesthetic Considerations
REFERENCE:	"Nature's Art," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.
ACTIVITY:	This activity may be used to show artistic designs in nature--the spider web--or to study the structure of a spider web. You will need a can of white spray paint and dark construction paper (or dark spray paint and white construction paper) to make the web adhere to the paper and show up on a different colored background.

Locate a spider web which is out in the open and can be approached from both sides; the corner of a roof or between branches of a tree are good places to look. Spray the web with paint so that it is completely covered. Before the paint dries, carefully press the paper into the web and on through the web. The paint will cause the spider web to stick to the paper; practice will allow you to do this without destroying the web.

The web pictures will now make pretty decorations or may be used to study how spider webs are constructed.

PURPOSE: To construct "fuzzy" animals.

LEVEL: K-3

SUBJECT: Fine Arts
Science

CONCEPT: I Bio-Physical.

PROBLEM: I Aesthetic Considerations.

REFERENCE: "Nature's Art," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: For this activity you will need blotting paper, waterproof glue, and grass seed.

An interesting way to study the growing process of seeds is to plant grass seeds on blotting paper. Have the students draw the outline of animals with fur--squirrel, bear, etc.--on blotting paper or a pattern of furry animals may be provided. Cut the blotting paper into an animal shape; using staples, attach a tab made of blotting paper to the back of the cut-out. With waterproof glue, attach grass seed to the front side of the animal where desired. Hang the animal so the tab on back is immersed in a container of water. It may be convenient to lean the animal against a glass of water with the tab inside the glass. Occasionally add plant food to the water supply.

The grass will grow to become the "fur" on the animal; don't forget to keep your grass--er "fur"--clipped.

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GRADE LEVEL 4-6

Activities	
Science	14
Science-Mathematics	3
Science-Social Studies	2
Science-Language Arts	1
Mathematics-Science	2
Mathematics-Social Studies	2
Social Studies	5
Social Studies-Science	6
Language Arts	3
Fine Arts	5
Fine Arts-Science	2

PURPOSE: To discuss how forest products are used by man.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

REFERENCE: Child Ecology, Child Ecology Press, Los Altos, CA.

ACTIVITY: This activity should show the students how man is closely tied to the forest and forest products. The term "forest products" provides a wider range of discussion than the narrower term "wood products."

As a lead-off for the discussion, have the students list all the items made from wood which they can find in their home and at school; allow the students to work on this list over night. List the items on the chalkboard.

Now have the students consider "non-wood" forest products; these may include plastics, drugs, chewing gum, syrup, oil, fruits, charcoal, tobacco pipes, paper goods, cellophane, and many more.

On a large bulletin board, draw a tree. Beside each part of the tree--limbs, leaves, trunk, bark, roots, etc.--name those products which are produced from these parts of the tree; include such products as fruits and nuts, sawdust, saps and gums, pulpwood, and so on.

The same procedure can be used with other forest products such as animals and herbs; these too can be represented on the bulletin board.

PURPOSE: To understand the principle by which paper is recycled.

LEVEL: 4-6
7-9

SUBJECT: Science

CONCEPT: III-4 Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: Ecology Action Pack, McDonald's Corporation, Oak Brook, Illinois 60521. 1973.

ACTIVITY: While recycling paper commercially requires huge machines and elaborate production lines, the basic steps of paper recycling can be done in the classroom or as a home project. Materials needed are: an old newspaper, mixing bowl, egg beater, wood block about 2 x 3 inches in size, a piece of window screen about 4 x 4 inches, a plastic sandwich bag, wallpaper paste or cornstarch, water, and a tablespoon. Directions:

1. Fill the bowl 1/4 full of water. Tear a half page of newspaper into tiny pieces. Place the pieces in the bowl and let them soak for at least one hour.
2. After the paper has become thoroughly soaked, beat it with an egg beater until the paper is broken into fibers. When the mixture has been beaten adequately, it should have the creamy texture of paper pulp.
3. Dissolve two heaping tablespoons of wallpaper paste or cornstarch in a pint of water. Pour into the pulp and stir.
4. Hold the piece of window screen flat and lower it into the pulp. Do this repeatedly until you accumulate a layer of pulp about 1/16th inch thick.
5. Set the pulp-covered screen on a newspaper and place a plastic bag over it. Press down with the wood block--gently at first, then with more pressure. The water will filter or be forced through the screen onto the newspaper.
6. Allow the fibers to dry for about 24 hours. Peel the fibers, now paper, from the screen.

PURPOSE: To learn how soil is made.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-2 Eco-Community Relationships--land use.

ACTIVITY: This is a series of short activities to allow students to learn how soil is made through the interaction of rocks and environmental factors.

Scrape two rocks together; the dust formed is the beginning of soil. How do rocks "scrape together" in nature? Consider wind particles.

Allow water ro run across a rock surface or to drip on a rock for a week. Placing rocks in a stream or studying the rocks already there would be a similar activity. Talk about the effects of rain and erosion.

Wrap a rock in foil or put it in a sack of some sort and place the rock in the freezer for several days. (The foil or sack prevents dirt from getting on other things in the freezer.) Observe any changes in the rock. Allow the rock to warm to room temperature and repeat the process. How does the freezing occur in nature?

Obtain two gallon jars and fill them with alternating layers of dark soil and sand approximately one-inch thick. Place several earthworms in one jar and label the jar. Cover both jars with black paper to prevent light from shining on the sides of the soil. After several days, remove the paper and observe the difference between the two soils. Earthworms make tunnels in the soil which allow air and rain to penetrate deeper into the soil. How does this affect the soil or the plants and animals in (or on) the soil?

PURPOSE: To investigate a paved desert.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: I-4 In any environment, one component--like space, water, air, or food--may become a limiting factor.

PROBLEM: IV-2 Eco-Community Relationships--land use.

REFERENCE: "Teacher Resource Booklet," Project ECO, Ames Community Schools, Ames, Iowa 50010.

ACTIVITY: This investigation is used to show variation in micro-climates and the effect of paved surfaces in changing the micro-climate.

Near the school, locate several paved deserts--concrete sidewalk, asphalt parking lot, paved road, etc. Investigate the temperature above, on, and below the areas at different times during the day. Compare these temperatures to similar readings taken in an area with grassy vegetation. If possible, take temperature readings during the night or early evening and early morning. Diurnal and seasonal temperatures should be recorded and graphed for display.

Comparison of the data from the grassy area and the paved areas should lead to discussions of the effect of paved surfaces upon the natural environment.

Similar investigations can be undertaken with light intensity and precipitation. Students will be able to see the relationship between light intensity and temperature and how this differs with different micro-climates.

PURPOSE: To understand the relationships between weather and pollution.

LEVEL: 4-6
7-9

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: II-3 Health Considerations--air quality.

REFERENCE: Energy and Man's Environment - Elementary Through Secondary Interdisciplinary Activity Guide. Education/Research Systems, Inc., 2121 Fifth Avenue, Seattle, Washington 98121.

ACTIVITY: Involve a small group of students in trying to determine the relationship, if any, between air quality, atmospheric, and other conditions. Using appropriate measuring instruments and data from the weather bureau or newspaper, collect for a period of three or four weeks daily readings on: (1) air quality index, (2) temperature, (3) humidity, (4) wind velocity, and (5) amount of sunlight.

Organize these data into a table, chart, or graph to show daily variations in air quality.

Have the group report their findings to the class and encourage discussion of questions such as: Does any factor appear to be consistently related to higher pollution? Does the data give any indication of how the pollution might be higher or lower when the weather is greatly different? Is the effect of weather on pollution beyond man's control? How can man reduce pollution? Will he?

PURPOSE: To illustrate plant transpiration.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: I-4 In any environment, one component - like space, water, air, or food - may become a limiting factor.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: Geology and Earth Sciences Sourcebook. Robert L. Heller, Editor, Holt, Rinehart and Winston, Inc., 1970.

ACTIVITY: Raise with the children questions about what happens to the water used to water plants such as geraniums and cacti that are kept in many elementary school classrooms. With their help plan an experiment to see if the weight of a plant and its container might change over a period of 24-48 hours.

Using two geraniums of roughly equal size water them appropriately. Enclose one geranium air tight in a clear plastic bag. Balance the two plants on a two pan scale and see if any difference in weight becomes apparent during the next two days. Which became lighter? Why? Was anything visible on the plastic bag? What actual change of weight occurred?

Repeat the experiment with two cacti. Did the same thing occur? Why or why not?

PURPOSE: To show how water is transported in plant tissue.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: I-2 Green plants are the ultimate sources of food, clothing, shelter, and energy in most societies.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Nature's Alphabet," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: This activity may be used to demonstrate the transportation of material within plants. After a study of roots and stems and their functions, introduce the concept of how food and water is moved throughout the plant.

Place a fresh celery stalk in a glass of water colored with food coloring. Very soon the colored water will be seen moving up tubes within the celery stalk. Allow the students to examine pieces of celery and especially the transportation tubes (vascular bundles).

Let the students try variations of the activity. Is the rate of water movement affected by light or heat? Split a celery part way up the stalk; place the split ends in containers,with different colored water, which are side-by-side.

PURPOSE: To understand how fertilizer affects aquatic life.

LEVEL: 4-6
7-9

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-9 Eco-Community Relationships--fertilizers and pesticides.

REFERENCE: Resource Materials on Conservation and Ecology - Independence Outdoor Laboratory, Charlotte, N.C. 28212.

ACTIVITY: Divide the class into groups of 2-4. Each group should obtain a one-gallon widemouth jar and fill it with pond or stream water known to contain some "little critters." Each group should try to get its water sample and 1-2 cm. of pond or stream bottom ooze from a different source.

In the classroom or laboratory, each group should verify through microscopic examination and use of an appropriate biology "key" that its sample contains organisms such as protozoa, hydra, rotifers, nematodes, diptera, and copepod.

If organisms are present, the group should divide the water sample and ooze into two glass containers. Into one, add a "pinch" of garden fertilizer. Examine microscopically and by gross visual inspection the contents of each jar over a period of several days to see if the fertilizer affected the number of organisms.

What is the cumulative effect of this phenomenon on streams and lakes? Is it generally good or bad? What can, or should be done about it?

PURPOSE: To examine snowflakes in the classroom.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: I-5 The natural environment is irreplaceable.

PROBLEM: IV-8 Eco-Community Relationships--weather.

REFERENCE: "Nature's Art," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: This activity gives students an opportunity to study snowflakes for a long period of time by embedding the flakes in lacquer.

Glass slides and spray lacquer should be kept in the freezing compartment of the refrigerator to keep all materials cold. When it is snowing, quickly take the slides and lacquer outside before they have time to warm up. Hold the slide with a clothespin to prevent body heat from warming the slide. Spray a thin coat of clear lacquer on the slide and catch a few snowflakes in the lacquer. Allow the slide to remain outside in the cold, but sheltered from more snow, for an hour. You can then bring the slides inside and examine the imprint of the snowflakes with hand lens or microscope.

PURPOSE: To study animal life in the snow.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Nature's Bulletin Board Ideas," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: This activity is an informational game that can be played using the bulletin board. This game can be played as part of a unit on animal habitats during Winter conditions; variations of the game can be used for other units of study.

Cover your bulletin board in a Winter scene, including areas where animals can be found in the Winter--forest, field, stream, etc. Each student is to hide an animal behind a snowbank in the Winter scene; a snowbank is a piece of heavy white paper shaped like this:

Have the students secretly draw an animal (or paste a picture from a magazine) on the back side of the snowbank; on the front side, have the student place some clue as to what animal may be hidden behind the snowbank. These clues may be the tracks of the animal, a special type of food, or picture of the animal's nesting place, etc. Pin the snowbank onto the Winter scene with only the front side of the snowbank showing. Then, every day, have one or two students "melt" their snowbanks to reveal what animal was hiding there.

PURPOSE: To show the effects of overcrowding.

LEVEL: K-3
4-6
7-9

SUBJECT: Science

CONCEPT: I-4 In any environment, one component--like space, water, air, or food--may become a limiting factor.

PROBLEM: IV-6 Eco-Community Relationships--population studies.

REFERENCE: Mary Rea, Dublin, Ohio, Middle School Teacher.

ACTIVITY: Divide the class into small groups. Each group should obtain or be given five flower pots or other small planting containers. The containers should be filled with soil from the same source and labeled A, B, C, D, and E. Plant in the containers widely differing numbers of one kind of seed such as radish, tomato, or corn. Geometric ratios such as the following might be used:

A = 2 seeds
B = 4 seeds
C = 8 seeds
D = 16 seeds
E = 32 seeds

Maintain all factors such as light, temperature, and moisture constant in all containers and make observations of growth that results during a period of 2-4 weeks.

What conclusions can be drawn about crowding and growth in plants? What does this mean to a gardener or farmer? Obviously, crowding affects plant growth. Does it also affect animal growth? How might it have the same results? How would it be different?

PURPOSE: To make insect cages.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Walnut Springs Interest Unit," Environmental Education Coordinator, State College Area School District, State College, PA

ACTIVITY: Insect cages can be made by students so that insects may be observed in the classroom. The materials needed are:

2 1-pound coffee can plastic lids
1 piece screen, 4" X 12"
plaster of paris

Roll the screen and fasten it with wire, string or staple to a cylinder 12 inches tall and 4 inches in diameter. Fill one coffee-can lid with a thick mixture of plaster of paris and set one end of the wire cylinder into it; allow this to harden and form the bottom of the insect cage. Cover the top of the cage with the second lid and fasten it on one side with wire or string to form a hinge. Now you have an insect cage.

PURPOSE: To observe how birds help to destroy insects.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Teaching Soil and Water Conservation," U.S. Department of Agriculture, Publication PA-341.

ACTIVITY: Have one or several pupils locate robin nests and find spots where they can watch them without disturbing the robins. After pupils are sure the eggs have hatched, have them watch the nest for an hour at the same time each day and count the number of trips the parent birds make to the nest. Do this for several days and average the number of trips they make in an hour.

Pupils can be fairly certain that the birds are carrying one or more insects on each trip.

After making the count for several days, average the number of trips the robins make per hour, multiply this figure by the number of hours of daylight. This will give an estimate of the total number of insects the pair of robins destroys in a day.

Have the class discuss how birds are helpful to farmers, gardeners, orchardists, and city dwellers. What kinds of insects do birds eat? Why do young birds need so much food? What, if anything, can be done by man to increase the number of birds in an area?

PURPOSE: To learn how to use and manage solar energy.

LEVEL: K-3
4-6

SUBJECT: Science

CONCEPT: III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.
III-3 Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: IV-4 Eco-Community Relationships--energy production.

REFERENCE: "Living Within Our Means: Energy and Scarcity," Environmental Education Instructional Activities K-6, State Department of Education, Albany, NY 12224.

ACTIVITY: On a sunny day in early Spring, take the class into a room on the sunny (south) side of the school building. Then go into a room on the shaded (north) side of the building. Ask the children if the air temperature in the two rooms felt different. Elicit that the first room felt warmer and that the sun has warmed it.

Ask which side of the school usually gets the most sun. If the children cannot remember, take the class outside at different times on a sunny day. They will probably discover that one side (south) gets the most sun while one other side (north) gets less. Explain that the side facing the sun should have many large windows to take advantage of the sun's warmth and that the opposite side of the building should have fewer windows.

Encourage the children to plan and build several diorama "houses" which would utilize the sun's warmth for heating. Place the completed houses on the window ledge in a sunny room. Discuss with the children how the houses should be oriented. To test their hypothesis, several houses should have the big windows facing away from the sun. Place small dishes of water in each of the model houses. After several hours, have the children test the temperature of the water with a lab thermometer.

-- In which of the model houses would the children expect to have the water feel warmer? Why?
-- If real houses were built with many windows facing the sun, how would that affect the amount of fuel necessary to heat them?
-- What problem might occur in the Summer?
-- How could this problem be prevented?

PURPOSE: To measure and graph water temperatures in ponds or streams.

LEVEL: 4-6
7-9

SUBJECT: Science
Mathematics

CONCEPT: IV-1 Organisms and environments are in constant change.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Teacher Resource Booklet," Project ECO, Ames Community Schools, Ames, Iowa 50010.

ACTIVITY: This investigation lets the students collect data over a period of time in one or more aquatic communities; use of thermometers, graphing, and data interpretation allows the students to gain experience in several areas.

Select a pond and/or stream (preferably both so comparison may be made) near the school site so visits can be made several times a day. Use Celsius (centigrade) thermometers to measure surface and subsurface temperatures in shade and direct sun. Subsurface temperatures should be taken at 20 cm. intervals by securing the thermometer to a meter stick or weighting it on a premeasured length of string. Allow the thermometer to remain at the desired depth for several minutes, then bring it quickly to the surface and read the thermometer before the air affects the reading. Data should be compiled in graph form.

Comparative studies can be conducted using data collected at several times during the day, in addition to comparing data from shade and direct sunlight, from pond and stream, from air temperature and water temperature. The metric system may be stressed and conversion techniques used.

PURPOSE: To estimate tree heights.

LEVEL: 4-6

SUBJECT: Science
Mathematics

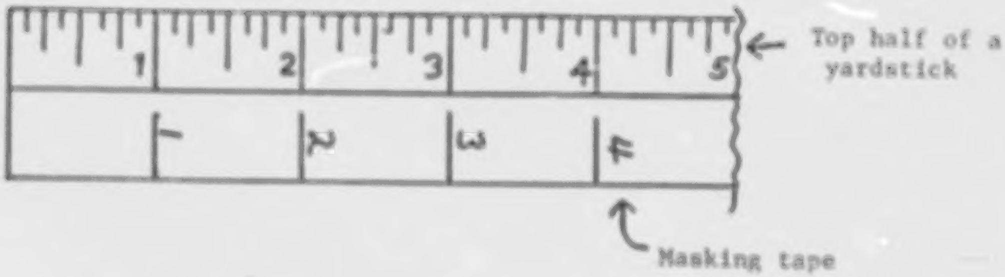
CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Environmental Education, Intermediate Division--Boalsburg School," Pennsylvania Department of Education, Outdoor Education Resources Center, Harrisburg, PA 17126.

ACTIVITY: Construct a Merritt Hypsometer for estimating heights from a yardstick.

Cover the lower half of a yardstick with masking tape, as shown in the diagram below, and extend the inch markers so they can be read when the stick is held vertically. Label the inch marks.



Using the Hypsometer, the student may now estimate heights with some accuracy. See the diagram on the following page. The Hypsometer works on a ratio of one inch to one foot. To set up the ratio, two similar triangles must be formed. One triangle is the eye and the stick (D C B in diagram) and the other triangle is with the eye and the object to be measured (E C A).

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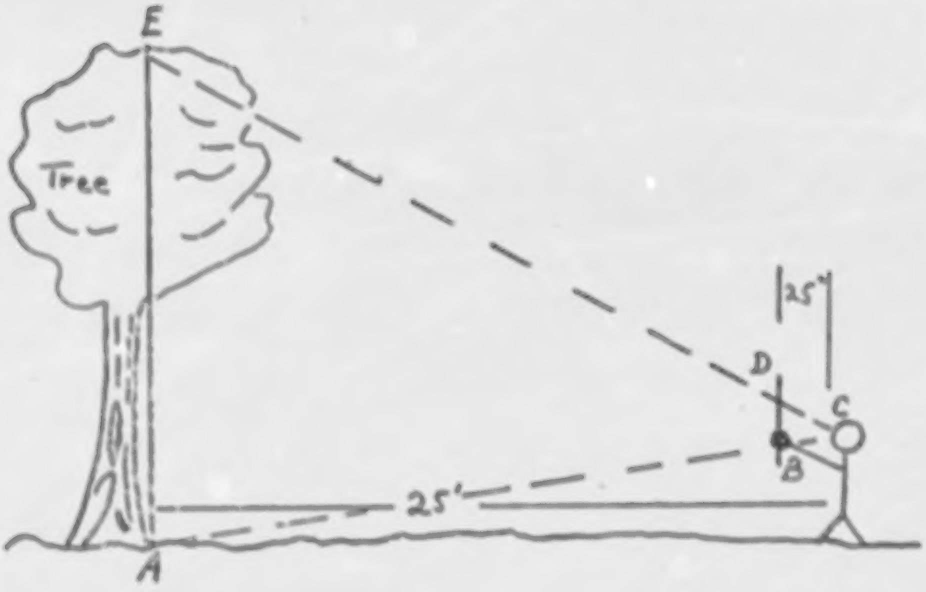
Hold the Hypsometer at arm's length and measure the distance from the eye to the stick in inches; for each inch pace off one foot from the tree to be measured. For example, if the stick is held 25 inches from the eye, pace off 25 feet from the tree. (The line AC is to the line BC as the height EA is to the stick DB.)

Pace off the proper distance from the tree to be measured. Hold the Hypsometer steady at arm's length so that the bottom of the stick is even with the bottom of the tree. Where the top of the tree strikes the Hypsometer, read off the height in feet.



PURPOSE: To show that variety exists among leaves on the same tree.

LEVEL: 4-6

SUBJECT: Science
Mathematics

CONCEPT: I-3 An organism is the product of its heredity and environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Differences in Living Things," National Wildlife Federation, Washington, D.C. 20036

ACTIVITY: The leaves on the same tree are not all alike as can be seen by comparing the surface area of various leaves. Provide the students with graph paper. Have them select leaves from several areas of the tree and trace the outline of each leaf on the graph paper. The area of each leaf can be determined by counting the number of whole squares on the graph paper that fall within the leaf outline; if the students can work with fractions of squares, these can be added in.

When this data has been determined, a bell-shaped curve can be drawn to show the normal range of leaf area. In addition, comparison can be made with leaves that grow in shade and those that grow in direct sunlight. Further comparison can be used to determine the relationship of length to area.

PURPOSE: To identify sounds on a hike around the school yard.

LEVEL: K-3
4-6

SUBJECT: Science
Social Studies

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM IV-1 Eco-Community Relationships--ecological considerations.
I-5 Aesthetic Considerations--noise.

REFERENCE: "Some 'Around the School Yard' Activities," U.S. Forest Service, Portland, Oregon.

ACTIVITY: Take the students on a "sound" hike around the school yard. Stopping at intervals along the way, have the students sit quietly and close their eyes for 30 seconds. At the end of the 30 seconds, have each student describe a sound he heard. The teacher should write down the way each student describes his sound. Can the sound be identified? Stop at many different places so there will be a variety of sounds to be heard.

After the hike, try to decide which sounds were natural and which were man-made; which sounds were loudest and which were quietest; which were highest in pitch and which were lowest; which were the most pleasant to hear and which were the most unpleasant. Are the man-made sounds the most plentiful? Would the sounds be different in a rural area? Is man causing a problem with too loud sounds?

PURPOSE: To understand how sanitary landfills are made.

LEVEL: 4-6
7-9

SUBJECT: Science
Social Studies

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: II-1 Health Considerations--disease control - breeding ground control.

IV-2 Eco-Community Relationships--land use.

REFERENCE: Teacher's Guide, Filmstrip and Tape "Garbage Pollution Has a Solution: The Sanitary Landfill." Instructional Media Division of Monterey County Board of Education, P. O. Box 851, Salinas, California 93901.

ACTIVITY: Plan to take a field trip to a large sanitary landfill operation. Prior to going involve the class in considering the variety and amount of substances that are thrown away daily by the typical American family. Is trash disposal a problem in both rural and urban areas? Can they cite personally known examples? Is garbage disposal less of a problem in rural areas? Why? What dangers are associated with trash and garbage disposals on open dumps?

After discussion on such questions have the class view and listen to the filmstrip-cassette tape presentation on sanitary landfills cited in the reference above. Compare the ideas generated by the class with those presented in the filmstrip-tape presentation. Is the problem in California similar to the one in their community? Why or why not?

Finally, visit an operating landfill in the community and compare its operation with that depicted in the filmstrip. Account for differences, if any.

Can they suggest waste disposal practices that are preferable to sanitary landfills?

PURPOSE: To become more aware of ecological interactions.

LEVEL: 4-6
7-9
10-12

SUBJECT: Science
Language Arts

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: Teachers Curriculum Guide For Field Ecology. Brevard County (Florida) School System.

ACTIVITY: In a basically natural setting such as a park, wooded area, meadow, or on the bank of a stream, ask a student to sit quietly alone for 20-30 minutes.

During this time, he should be instructed to do something such as:

1. Listen for sounds and record in a notebook all sounds that he hears. He should also attempt to identify the source of all sounds heard.
2. Record all smells that he can sense. Try, again, to identify the source of each.
3. Record all that is seen. While sitting quietly he may see interesting activities of birds, insects, and larger animals. Suggest that students look for examples of interactions between animals or between animals and plants.

After returning to the classroom, ask the students to write a paper in which they summarize or create a story about what they heard, smelled, and saw. Did they like the experience? Why, or why not? What traits are necessary to be a good naturalist?

The activity might be repeated in a basically man-made environment such as along a city street, in the foyer of a large building, or on a bus. Again, the students could be asked to record what they see, hear, or smell and look for interactions between organisms or between organisms and their environment.

After returning to the classroom, students could write summary or reaction papers and evaluate the experience. They might also be asked to explain why they preferred studying the natural or man-made environment.

PURPOSE: To become aware of local precipitation patterns and variations.

LEVEL: 4-6
7-9

SUBJECT: Mathematics
Science

CONCEPT: I-4 In any environment, one component - like space, water, air, or food - may become a limiting factor.

PROBLEM: IV-8 Eco-Community Relationships--weather.

ACTIVITY: Obtain from the local weather bureau weekly or monthly rainfall data for the past 25-40 years. Provide each student or group of two students with the data for one year. Provide standard size graph paper or have the class agree on a common scale to be used and request each student to graph the weekly or monthly rainfall for his particular year.

Following the preparation of graphs for the separate years involve the class in preparing another graph that shows lowest, highest, and mean precipitations for the years, months and/or weeks they have used.

How much variation was found? What months or weeks are driest? Wettest? Does the precipitation occur when needed for plant growth? What is the "ideal" time, rate, and amount of precipitation for various plants? Does rainfall follow a cyclical pattern? What, if anything, can man do to influence this pattern?

PURPOSE: To determine the special relationships of the earth to the solar system.

LEVEL: 4-6

SUBJECT: Mathematics
Science

CONCEPT: I-5 The natural environment is irreplaceable.

PROBLEM: IV Eco-Community Relationships.

REFERENCE: "Elementary Science Guide," Division of Elementary Education, State Department of Education, Richmond, VA 23216.

ACTIVITY: Although we usually think in terms of local ecosystems such as a forest or stream, in a larger sense the whole earth is one ecosystem existing in the larger ecosystem of the solar system. This activity places the earth in special perspective to the other planets of the solar ecosystem. This may serve as a linkage between a study of the universe and a study of narrower earth ecosystems.

Construct a model of the solar system on a football field using information gathered on relative planet diameters and distances from the sun.

Using a scale of one-inch equals one million miles, the following approximate "distance from the sun" can be determined:

Mercury = 36 inches
Venus = 67 inches
Earth = 93 inches
Mars = 141 inches
Asteriod Belt = 300 inches
Jupiter = 483 inches
Saturn = 886 inches
Uranus = 1,783 inches
Neptune = 2,791 inches
Pluto = 3,671 inches

For relative sizes of sun and planets, students may draw circles on paper with diameters as indicated or use the suggested ball.

Sun	5 feet	gigantic balloon
Mercury	1/4 inch	small marble
Venus	5/8 inch	tennis ball
Earth	5/8 inch	tennis ball
Mars	3/8 inch	ping-pong ball
Jupiter	6-3/4 inch	basketball
Saturn	5-1/2 inch	soccer ball
Uranus	2-1/4 inch	baseball
Neptune	2-1/4 inch	baseball
Pluto	1/4 inch	small marble

Have the students calculate and measure the proper distances to place the "planets." Do not isolate the students by having one of them hold a "planet" in place; rather, put the object on a stake or on the ground with a flag beside it so it can be located.

If the activity is being used to focus in on the earth's environment (or focusing out from the earth to the universe), make that point carefully with such questions as:

In what ways does the earth differ from the other planets?

How does the sun affect life on earth?

Would conditions on earth be different if the earth was located farther from or closer to the sun?

Now we are going to consider the various types of environments that make up our planet Earth.

PURPOSE: To become more aware of the amount of metal and glass thrown away by American families.

LEVEL: 4-6

SUBJECT: Mathematics
Social Studies

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

REFERENCE: Teaching Science with Garbage. An Interdisciplinary Approach to Environmental Education from the Points of View of Science, Mathematics, and Social Studies. Albert Schatz and Vivian Schatz.

ACTIVITY: Ask each pupil to involve his entire family in saving all cans and disposable bottles used during a two-week period. Cans should be washed to eliminate food source for flies or other insects.

At the end of the two-week period, each pupil should bring to the class data regarding the number and weight of aluminum cans, tin cans, and throwaway glass bottles.

Organize data from the entire class into a large matrix on the chalkboard and involve children in calculating total amounts of various materials thrown away, amounts per family, amounts per person. Speculate on how much is thrown away by all families with children in the school. By all families in the city.

Should we be concerned with this problem? Why, or why not? What can they or their families do about it? What, if anything, might or should the government do?

PURPOSE: To study the nature of passenger car traffic flow.

LEVEL: 4-6
7-9

SUBJECT: Mathematics
Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: V-2 Psychological and Behavioral Considerations--social aspects.

ACTIVITY: Ask the class to work in teams of two to collect data on the number of passengers riding in automobiles that are going different directions across a busy intersection. Record the number of passenger automobiles carrying only one, two, three, four, or more passengers. Record either for a specified time or until a certain number of cars, such as 100, have been recorded. Ask each team to calculate percentages of cars with different numbers of passengers. If possible, repeat at a significantly different time of day.

In class, have each group enter its data into a large table for the purpose of developing a more reliable sample and sounder conclusions.

Discuss questions such as: Does direction of traffic flow seem to make a difference? Why? Does time of day make a difference? Were you surprised at the results? Did you get evidence to support the idea that people are forming car pools to save gasoline?

PURPOSE: To identify and locate open space recreation areas in the community. To survey public awareness and use of these facilities.

LEVEL: 4-6
7-9

SUBJECT: Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and life-ways that are transmitted to its progeny.

PROBLEM: I-11 Aesthetic Considerations--recreational facilities.

REFERENCE: Environmental Pollution Education - Curriculum Resource Guide. St. Joseph's Calumet College, East Chicago, Indiana.

ACTIVITY: Provide each student with a map (topographical-political if possible) of a sizeable community area such as a county. As a homework or over-the-weekend assignment, ask each student to use his parents or siblings as resource persons to locate the open-space recreation areas they know about. They may also indicate the ones they have visited personally.

Invite to the class someone from a Metropolitan or County Park Board to help locate on a large map all areas identified by the students. This person could identify other areas not named or known to the students. He may also indicate areas receiving excessive or very little use.

Students might develop a questionnaire to ascertain the extent to which a sample of students and adults in their school's attendance area know about and use the open-space recreation areas available to them. Discussion of data obtained could include: Are the facilities adequate? Are they advantageously located? Are they well kept? Who pays for them?

PURPOSE: To sense relationships between recreational activities and energy usage.

LEVEL:
4-6
7-9
10-12

SUBJECT: Social Studies

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

REFERENCE: Energy and Man's Environment. Elementary Through Secondary Interdisciplinary Activity Guide, Education/Research Systems, Inc., 2121 Fifth Avenue, Seattle, Washington 98121.

ACTIVITY: Ask the students to work in groups of three and develop a chart in which they (1) list all of the common recreational activities they can think of, (2) name the kinds of energy needed to engage in each recreational activity, (3) judge the extent to which each activity is healthful or harmful, (4) estimate how popular each recreational activity is in their community, state and nation, and (5) the extent of their personal interest in each activity. Ask each group to be creative in designing the chart or table so it can include easily all of the judgments requested.

Summarize the material developed by the small groups in a large matrix on the chalkboard, or large sheet of paper, and discuss the results.

Do spectator sports such as football require much energy? What kind? How would they rate a major sporting event such as the Indianapolis 500-Mile Auto Race? How would they compare tent camping with vacationing in a mobile home? What is their judgment about the desirability of sporting arenas such as the Astrodome?

Is the general pattern of recreational activity in America geared to high energy use? If so, what can and/or should be done about it?

PURPOSE: To understand how transportation affects population growth.

LEVEL: 4-6
7-9

SUBJECT: Social Studies

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: IV-6 Eco-Community Relationships--population studies.
V-2 Psychological and Behavorial Considerations--social aspects.

REFERENCE: "A Supplementary Program for Environmental Education--Science," Project I-C-E, 1927 Main Street, Green Bay, WI 54301.

ACTIVITY: This activity is used to help students decide why people settle in a particular place. An emphasis may be placed on the transportation of people and goods into and out of an area.

Give each student several outline maps of the state where he lives. If possible, use maps that show variations in population, rainfall, growing season, and economic activities. These, or similar maps, may be available through your State Department of Natural Resources or U.S.D.A. Agriculture Extension Service. The students may want to color in their maps, using a different color to show variations in one factor. How are the several factors interrelated?

List the 5 or 10 largest cities in your state. Have the students locate them on their maps. Why are the cities located in that particular spot? Is there a river or lake nearby? What forms of transportation come into the areas today? Was this different when the cities were first settled?

PURPOSE: To find how man's demands on the environment bring about change.

LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: IV-5 Eco-Community Relationships--urban planning.

REFERENCE: "Elementary Science Guide," Division of Elementary Education, State Department of Education, Richmond, VA 23216.

ACTIVITY: Have the class visit several areas in the city where the human population is on the increase. Observe the changes in land use, the number of new buildings, the number of apartments versus the number of single family dwellings, the amount and type of materials being used. What kinds of demands are made upon the environment in relation to the life needs of the residents? Will more shopping areas be needed? Is the land available for shopping centers? How will traffic patterns in the area be affected? Check with local officials about increasing water and power consumption, solid waste disposal problems, and land erosion. Are any plans being made to maintain a natural or open-space area? Is this important?

Develop alternate solutions to the problems of the increased population and hypothesize the results of the solution.

If you had control of the land in the area before the sudden influx of people, how would you change the way it has developed?

If you could control the development of a new residential area which of the two plans shown on the next page would you prefer? Why? Try to explain why one of the plans is used so much more often than the other.

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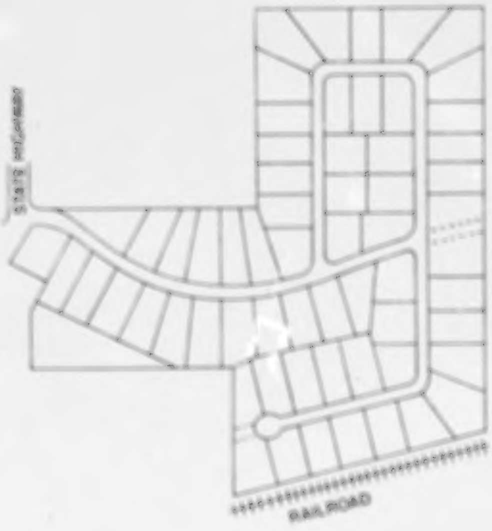
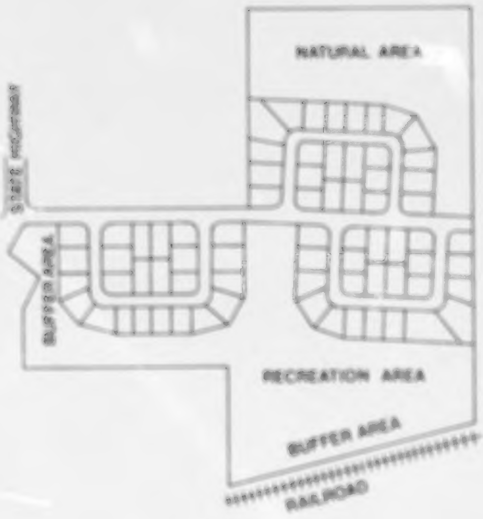

STATE HIGHWAY
RAILROAD


STATE HIGHWAY
NATURAL AREA
BUFFER AREA
RECREATION AREA
BUFFER AREA
RAILROAD

PURPOSE: To discover how "waste" materials are made useful.

LEVEL: K-3
4-6
7-9

SUBJECT: Social Studies

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: IV-3 Eco-Community Relationships- natural resource use.

REFERENCE: "A Supplementary Program for Environmental Education--Social Studies," Project I-C-E, 1927 Main Street, Green Bay, WI 54301.

ACTIVITY: This is a study of how items that were once considered to be waste materials are now products in demand. The activities should be generated by the class through the teacher's guidance.

As the class winds up a project and begins to dispose of the material gathered for the project, begin a discussion on what happens to waste material and how can it become a useful material again.

While discarding waste paper, begin a discussion of paper recycling. Visit a print shop and a recycling center. Try to determine how much paper is thrown away in a day in your class, in your school. Calculate this in terms of dollars and cents. How much does it "cost" to recycle paper.

The study of sawdust is a fun unit. Sawdust was once a waste product but is now in demand for sweeping compounds, particle board, paper manufacture, and other products. A trip to a sawmill might be of interest here.

PURPOSE: To explore the concept of "waste," its uses, misuses and abuses.

LEVEL: 4-6
7-9

SUBJECT: Social Studies
Science

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

REFERENCE: Doreen Uhas, Columbus, Ohio, Junior High School Teacher.

ACTIVITY: By touring the neighborhood, especially on garbage collection day, or by bringing in a day's worth of kitchen garbage in a clear plastic bag, students can try to answer questions as to why someone threw away what they did. Is there anything that might have been used again in another way? How much of it might not have been thrown away in another home or country? Do certain factors such as age, economic level, or ethnic origin enter into a disparity of more waste or less waste? What, in general, does a collection of garbage tell about our lifestyles and tastes?

Can students imagine what might be included if, for example, we examined a bag of garbage from a home in China? From California? From a farm? What do they think is the "best" way to dispose of garbage? Why? Why do we use many ways that aren't the best?

PURPOSE: To understand problems associated with pet food use.

LEVEL: 4-6
7-9

SUBJECT: Social Studies
Science

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: IV-7 Eco-Community Relationships--species control (non-human).

ACTIVITY: Ask the students to bring to class labels from canned or packaged pet food. Hopefully twenty or more different labels can be obtained.

Involve students in categorizing on the chalkboard all of the substances listed on the various labels. How many contain cereal? Is the cereal source specified? How many contain meat? Is the meat source given? How many contain fish? Are vitamin and mineral enrichment substances used?

Challenge students to get from the school or community librarian some reliable information about the number of pet animals (particularly dogs and cats) in the U.S.A.

How expensive is it to feed such animals if they are kept in cities? Is it O.K. to kill whales or wild mustangs for pet food? Why or why not. Feed used for pets in America and other rich countries is unavailable to feed starving persons in very poor countries. Should this be of concern to us? Why or why not?

PURPOSE: To understand how modern machinery influences land usage.

LEVEL: 4-6
7-9

SUBJECT: Social Studies
Science

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: IV-2 Eco-Community Relationships--land use.

ACTIVITY: Review with the class the philosophic principle that possibly man should try to establish a harmonious relationship with his natural environment. Consider with the class the recent historical development of bulldozers, power shovels, and other powerful earth-moving equipment. Review how they are used to level hills, fill in valleys, change shallow water areas into apartment building sites, etc. Ask each class member to jot down, if he can, five beneficial and five harmful results of the bulldozer and other comparable earth-moving equipment.

Pool the items and determine those most commonly cited as positives and negatives. Discuss specific examples in the community or country where benefits seem to be maximized and costs minimized.

Should the people, as represented by their government, have anything to say about how bulldozers, etc., can be used on private land? Why, or why not?

PURPOSE: To sense the enormity of the electrical appliance industry in the U.S.A.

LEVEL:
4-6
7-9

SUBJECT:
Social Studies
Science

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

ACTIVITY: Involve students in building a list of electrical appliances in common use. The list will probably be started by students naming electrical refrigerators, stoves, fans, lights, radios, TV's, and so forth. After listing 20 or so items, ask the students to work individually or in groups of two or three to see how long a list they can develop. Their ultimate lists will likely include electric toothbrushes, record players, electric trains, grass clippers, and many many more. Suggest they use mail order catalogs, newspaper advertisements, and visits to department stores to get ideas.

Build with the class a master list of all electrical items identified by class members. Ask each child to vote on the importance of the item. Is it vitally necessary? Nice but not necessary? Strictly a luxury item?

Discuss the extent of agreement or disagreement on several items. How important is electricity in our "life style"? Might we be using too many electrical appliances and too much electricity for our own good? Why or why not?

PURPOSE: To understand the energy demands of fast-food operations.

LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: IV-4 Eco-Community Relationships--energy production.

V-3 Psychological and Behavioral Considerations--cultural considerations.

ACTIVITY: Involve the class in trying to explain the phenomonal growth of the fast-food industry in the U.S.A. during the past decade. Help students understand that large national operations such as McDonald's, Kentucky Fried Chicken, Arthur Treachers, Burger King, Arby's as well as large locally known drive-in eating places were unknown a few years ago. If feasible, arrange to take the class on an early morning field trip to such a place and have someone who knows the operation well explain how they can produce their meals so quickly. Give particular attention to the energy using equipment found.

Do they use frozen food? Do they have much refrigeration equipment? What other power appliances or equipment are found? Does it take more energy to prepare food in such a place than it does at home? Are such places trying to conserve energy? Why or why not?

Consider also the amount of energy used by people to get from homes to fast-food eating places. Have such places noticed any slacking-off of business as a result of increased gasoline costs? Do they anticipate a growing problem in this regard?

Projecting ahead what does the class believe will happen in the fast-food industry during the next 10-20 years. Will such growth as noticed in recent years continue or even accelerate? What assumptions and/or facts have they taken into account in reaching their prediction?

PURPOSE: To become aware of organized group efforts to work on environmental problems.

LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

ACTIVITY: Ask for individuals or very small groups of students to take responsibility for drafting letters to organizations such as those listed below. Request information concerning purposes of the organization, size of membership, membership requirements, outstanding accomplishments, and other information available to publicize the organization.

Ask two or three students to review carefully the material received and to report their findings to the class. What kind of person joins the group? Is it a nationwide group? Is there a local chapter? Has the group been successful. What evidence can be cited? Would the group be interested in having students join?

If possible have a local member of such a group talk to the class to review their concerns and successes.

The Sierra Club
1050 Mills Tower
220 Bush Street
San Francisco, California 94104

Friends of Animals
11 West 60th Street
New York, New York 10023

The Wilderness Society
1901 Pennsylvania Avenue., N.W.
Washington, D.C. 20006

Friends of the Earth
72 Jane Street
New York, New York 10014

Zero Population Growth
1346 Connecticut Avenue, N.W.
Washington, D.C. 20036

Scientists Institute for Public Information
30 East 68th Street
New York, New York 10021

Planned Parenthood-World Population
515 Madison Avenue
New York, New York 10022

National Audubon Society
950 Third Avenue
New York, New York 10022

The Izaak Walton League
1841 South River Road
Des Plaines, Illinois 60016

The Conservation Foundation
1717 Massachusetts Avenue, N.W.
Suite 300
Washington, D.C. 20036

The Mother Earth News
P. O. Box 38
Madison, Ohio 44057

PURPOSE: To encourage better vocabulary usage.

LEVEL: K-3
4-6

SUBJECT: Language Arts

CONCEPT: II Socio-Cultural.

REFERENCE: "Nature's Bulletin Board Ideas," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: This activity is designed to introduce new vocabulary words and their usage through the visual display of a bulletin board.

Cover the bulletin board with a light-colored paper and, with a black felt pen, sketch a large spider's web that covers the whole board, perhaps adding a spider in one corner. Label the bulletin board "Weave A Web Of Words." On strips of light-colored paper (but different from the background of the bulletin board) print new words which you want or expect the students to know. Tack these words to the web at various points. As new vocabulary words are introduced, more words may be added to the web or others removed. Following a field trip, the students may have words of their own to add to the bulletin board. You may want to put up words that the students should include in a story or a report.

PURPOSE: To develop dictionary usage and writing skills as related to a report or creative writing assignment on water.

LEVEL: 4-6

SUBJECT: Language Arts

CONCEPT: I-4 In any environment, one component--like space, water, air or food--may become a limiting factor.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

REFERENCE: Interdisciplinary Outdoor Education, Shoreline School District No. 412, King County, Seattle, Washington.

ACTIVITY: As part of a study of the importance of water as a natural resource or the importance of a community water supply, the teacher could place on the chalkboard a list of words commonly used in discussing water problems. The list might include the following: pollution, condensation, evaporation, contamination, purification, chlorine, filtration, ground water, artesian, surface water, water table, aqueduct, standpipes, distilled water, hard water, soft water, reservoir, irrigation, and algae.

Ask each pupil to write a one- or two-page report or bit of creative writing that will include as many as possible of the suggested words used and spelled correctly. Have some of the pupils read their reports or stories to classmates and discuss whether the words were used correctly and forcefully.

PURPOSE: To develop ecological awareness through literature.

LEVEL: K-3
4-6

SUBJECT: Language Arts

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Living Within Our Means: Energy and Scarcity," Environmental Education Instructional Activities K-6, State Department of Education, Albany, NY 12224.

ACTIVITY: Many stories and books on nature, ecology, and the environment are available in libraries today. These books may be used and serve as springboards for discussion of the environment.

Some possible literature to use is:

Noah's Ark by Gail E. Haley

Who Killed Cock Robin? by Jean George

The Wasp World by Bill Peet

The Dead Tree by Alvin Tresselt

Lives of an Oak Tree by Ross E. Hutchins

Lookout for the Forest by Glenn O. Blough

My Side of the Mountain by Jean George

Let's Look Under the City by Herman & Nina Schneider

Gay-neck, The Story of a Pigeon by Dhan Gopal Mukerji

PURPOSE: To become more aware of beauty in the world.

LEVEL: K-3
4-6

SUBJECT: Fine Art

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and life-ways that are transmitted to its progeny.

PROBLEM: V-3 Psychological and Behavioral Considerations--cultural considerations

ACTIVITY: Suggest to the class that it would be nice if they could help make the classroom more attractive. Ask individual students to identify their "most beautiful thing." Responses will likely include such things as favorite animal pets, sunset, a brother or sister or parent, a flower, a toy, a mountain, and many other objects perceived as beautiful by children.

Arrange for two or three children, who agree that a certain thing is beautiful, to work together to prepare a collage or painting that can be displayed for some time in the classroom.

Ask the collage builders to share, with the class, their feelings about the objects included in their creative effort. Is their beauty created by man, nature, or both? What, if anything, must be done to maintain it? Is our world getting more beautiful or uglier? What evidence can they give? What can they do about it?

PURPOSE: To increase student concern for the school environment.

LEVEL: 4-6
7-9

SUBJECT: Fine Arts

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: V-3 Psychological and Behavioral Considerations--cultural considerations.

ACTIVITY: The fine arts teacher might involve his class in thinking about what they can do to improve the beauty of classrooms, halls, offices, lunchroom, and other areas in the school. Following the discussion each student could undertake to develop at least one project that will improve the school environment.

Obvious projects might include making ceramic objects for display in offices or showcases, paintings to be hung on bulletin boards or other appropriate places, eye-catching bulletin board displays that illustrate what is being studied in different classrooms, and making attractive signs to identify important places or transmit messages.

Using the National Park Service symbol of "Smoky Bear" as a model, a small group of fine arts students might undertake to develop a series of small symbols with appropriate messages that would emphasize student responsibility for their school environment.

PURPOSE: To sense the influence of different types of sounds.

LEVEL: K-3
4-6

SUBJECT: Fine Arts

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: I-5 Aesthetic Considerations--noise.

REFERENCE: Environmental Pollution Education - Curriculum Resource Guide. St. Joseph's Calumet College, East Chicago, Indiana.

ACTIVITY: Have paint or crayons and paper ready for use by each child. Play a recording of soft, beautiful music and ask each child to relax and listen to it with eyes closed. Ask children to paint or draw what they felt or "saw" as they listened to the music.

The next day, repeat the art activity but this time play a strident, raucous recording that might include sounds similar to "noise" heard on typical city streets. Again ask children to express their feelings through drawing or painting.

In comparing their drawings and feelings, which kind did they like better? Why? When is "noise" O.K. or even desirable? What kinds of sound do they prefer for different purposes? What responsibility should they and their siblings assume for making "good" or "bad" sounds?

PURPOSE: To make a creative bookmarker using natural materials.

LEVEL: K-3
4-6

SUBJECT: Fine Arts

CONCEPT: I Bio-Physical

PROBLEM: I Aesthetic Considerations

REFERENCE: "Nature's Art," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: For this activity you will need: pressed flowers, leaves, or similar dried materials; poster paper; and clear contact paper. The same procedure may be followed in constructing other art forms.

Cut the poster paper into the size bookmarker you want; cut the clear contact paper about 1/4 inch larger in all dimensions than the poster paper. Arrange the dried objects on the poster paper in the desired design; carefully cover the arrangement with the contact paper and fold the overlapping contact paper around the edges of the poster paper. Your nature bookmark is now ready for use. These would make good gift ideas.

PURPOSE: To have individuals express their personal attitude toward pollution through creative art forms.

LEVEL:
K-3
4-6
7-9
10-12

SUBJECT: Fine Arts

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: I-10 Aesthetic Considerations--cultural opportunity.

REFERENCE: Hershey, John T. *et al*. *A Curriculum Activities Guide to Water Pollution and Environmental Studies*. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: This activity gives students a chance to become more aware of the environmental crisis through their art and pass this awareness to others. Students of all ages and all kinds of artistic abilities can participate.

The activity may be initiated by having the class visit a scene of actual pollution. There, and at other sites, the students may collect the trash or symbols of the pollution; some of these may be included in the actual making of the art form. Posters, collages, mobiles, sculptures, and other art forms may be used; creative dance, plays, and songs should also be considered. The art forms should be displayed in various areas of the school and community.

PURPOSE: To capture spider webs with spray paint.

LEVEL: K-3
4-6

SUBJECT: Fine Arts
Science

CONCEPT: I Bio-Physical

PROBLEM: I Aesthetic Considerations

REFERENCE: "Nature's Art," Interlakes Environmental and Outdoor Education Program, Chester Area Schools, Chester, SD 57016.

ACTIVITY: This activity may be used to show artistic designs in nature--the spider web--or to study the structure of a spider web. You will need a can of white spray paint and dark construction paper (or dark spray paint and white construction paper) to make the web adhere to the paper and show up on a different colored background.

Locate a spider web which is out in the open and can be approached from both sides; the corner of a roof or between branches of a tree are good places to look. Spray the web with paint so that it is completely covered. Before the paint dries, carefully press the paper into the web and on through the web. The paint will cause the spider web to stick to the paper; practice will allow you to do this without destroying the web.

The web pictures will now make pretty decorations or may be used to study how spider webs are constructed.

PURPOSE: To create natural prints through a dry photographic process.

LEVEL: 4-6
7-9

SUBJECT: Fine Arts
Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: I Aesthetic Considerations.

REFERENCE: "Teacher Resource Booklet," Project ECO, Ames Community Schools, Ames, Iowa 50010.

ACTIVITY: The dry photographic process in this activity uses light sensitive paper which, when developed, darkens where light has hit the paper. The finished print has light objects on a dark background.

In making the print, the student may create a photograph with natural materials which he has collected and pressed. The same process may also be used to make a photographic collection of pressed leaves or flowers. A plant key could be developed with these prints.

To make prints, you will need the following materials:

Diazo, Driprint, or Ozalid paper	8-1/2 X 11 (*)
Glass sheet	8-1/2 X 11 (*)
Heavy cardboard	8-1/2 X 11 (*)
Large-mouth gallon jar with lid	
Household ammonia	
Masking tape	

(*) Any size will do as long as the paper, glass, and cardboard are approximately the same size.

Cover the edges of the glass with masking tape for safety and to form a border on the finished print. The tape also affords a place for the fingers to hold the assembly during exposure to the sun without showing a print of the fingers as well as of the leaf or other material being printed.

In the bottom of the gallon jar, place a tissue or paper towel saturated but not soaked with ammonia. Actually, enough ammonia to fill the jar with fumes is all that is needed. You may wish to place a piece of crumpled wire or coat hanger in the bottom of the jar so the photographic paper will not actually come in contact with the ammonia.

Find a shaded or semi-dark place to work. Place a piece of Diazo paper--yellow or glossy side up--on the cardboard. On this yellow or glossy side, arrange your leaf or other materials in an appropriate design. Cover and flatten the materials against the paper with the glass sheet.

Turn this assembly--glass side up--and expose it to strong sunlight (or artificial light) for a few seconds until the paper turns white. Remove from sunlight and place the exposed paper in the jar containing the ammonia fumes and close the lid.

The ammonia fumes will quickly develop the print. If development is uneven, remove the print from the jar and reverse the paper so the undeveloped portion will be toward the bottom of the jar where the ammonia fumes are more concentrated. Remove the paper from the jar when print has developed evenly.

The print is then completed. Mount and label the prints and place them out for display.

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GRADE LEVEL 7-9

Activities	
Science	6
Science-Mathematics	3
Science-Social Studies	5
Science-Language Arts	1
Mathematics-Science	1
Mathematics-Social Studies	3
Social Studies	14
Social Studies-Science	12
Social Studies-Mathematics	1
Language Arts	3
Fine Arts	2
Fine Arts-Science	1

PURPOSE: To show changes in soil.

LEVEL: 7-9

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.
IV-4 Man has been a factor affecting plant and animal succession and environmental processes.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "The Changing World," Junior High School Science, Baltimore County Public Schools, Towson, Maryland 21204.

ACTIVITY: Environments are in constant change and this change is often affected by man. The structure of soil is subject to many changes. This activity looks at compaction of the soil.

Locate a well-traveled path across a piece of land near school. Place two stakes on opposite sides of the path so they are approximately 2 meters apart. Stretch a string between the two stakes.

Starting at one stake, have the students measure the compaction of the soil at 15 cm. intervals along the line of the string. This can be done using a pencil or wood dowel as a depth gauge. Starting at its point, mark the pencil at 1 cm. intervals. At each 15 cm. point along the string; push the pencil into the soil with the palm of your hand; stop when the pencil begins to feel uncomfortable against the palm. Record the depth of the gauge.

Record the depth of penetration at each 15 cm. interval across the path. Construct a graph to show the relationship between depth and distance from the first stake.

How does the method of applying pressure to the gauge affect the results?

At what points along the string was it most difficult to push the gauge? Why?

Describe the plant life in the area of the path. Is there any relationship between compaction and plant life?

Will animal life be affected by soil compaction?

How will compaction affect the rate of erosion?

PURPOSE: To understand the relationships between weather and pollution.

LEVEL: 4-6
7-9

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: II-3 Health Considerations--air quality.

REFERENCE: Energy and Man's Environment - Elementary Through Secondary Interdisciplinary Activity Guide. Education/Research Systems, Inc., 2121 Fifth Avenue, Seattle, Washington 98121.

ACTIVITY: Involve a small group of students in trying to determine the relationship, if any, between air quality, atmospheric, and other conditions. Using appropriate measuring instruments and data from the weather bureau or newspaper, collect for a period of three or four weeks daily readings on: (1) air quality index, (2) temperature, (3) humidity, (4) wind velocity, and (5) amount of sunlight.

Organize these data into a table, chart, or graph to show daily variations in air quality.

Have the group report their findings to the class and encourage discussion of questions such as: Does any factor appear to be consistently related to higher pollution? Does the data give any indication of how the pollution might be higher or lower when the weather is greatly different? Is the effect of weather on pollution beyond man's control? How can man reduce pollution? Will he?

PURPOSE: To observe and determine the amount of water released during transpiration.

LEVEL: 7-9
10-12

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: Hershey, John T. et al. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: Have the students select a tree with low-hanging branches; enclose a leaf or small branch in a clean, dry plastic bag, having weighed the bag beforehand. Tie the bag shut with string and seal the closure with vaseline. After an appropriate amount of time, collect the bags and quantitatively determine the amount of water transpired by using a sensitive balance or scales and subtracting the dry weight of the plastic bags. Students can compare different transpiration between night and day, leaves in shade and direct sunlight, and leaves of different sizes; perhaps a method of measuring the amount of water transpired by a tree in a 24-hour period can be determined. The same activity may be performed with potted plants indoors where more factors--amount of light, availability of water--can be controlled.

Advanced students may wish to set up the apparatus shown on the following page. By filling the system completely with water, the quantity of water used by a plant at various intervals can be measured as water moves down the pipette. Be sure where the plant stem came out of the stopper, the hole is sealed with cotton and vaseline. The upper end of the pipette is open; if the activity is to be carried on for a long period of time, a film of oil may be placed on top of the water in the pipette to prevent evaporation.

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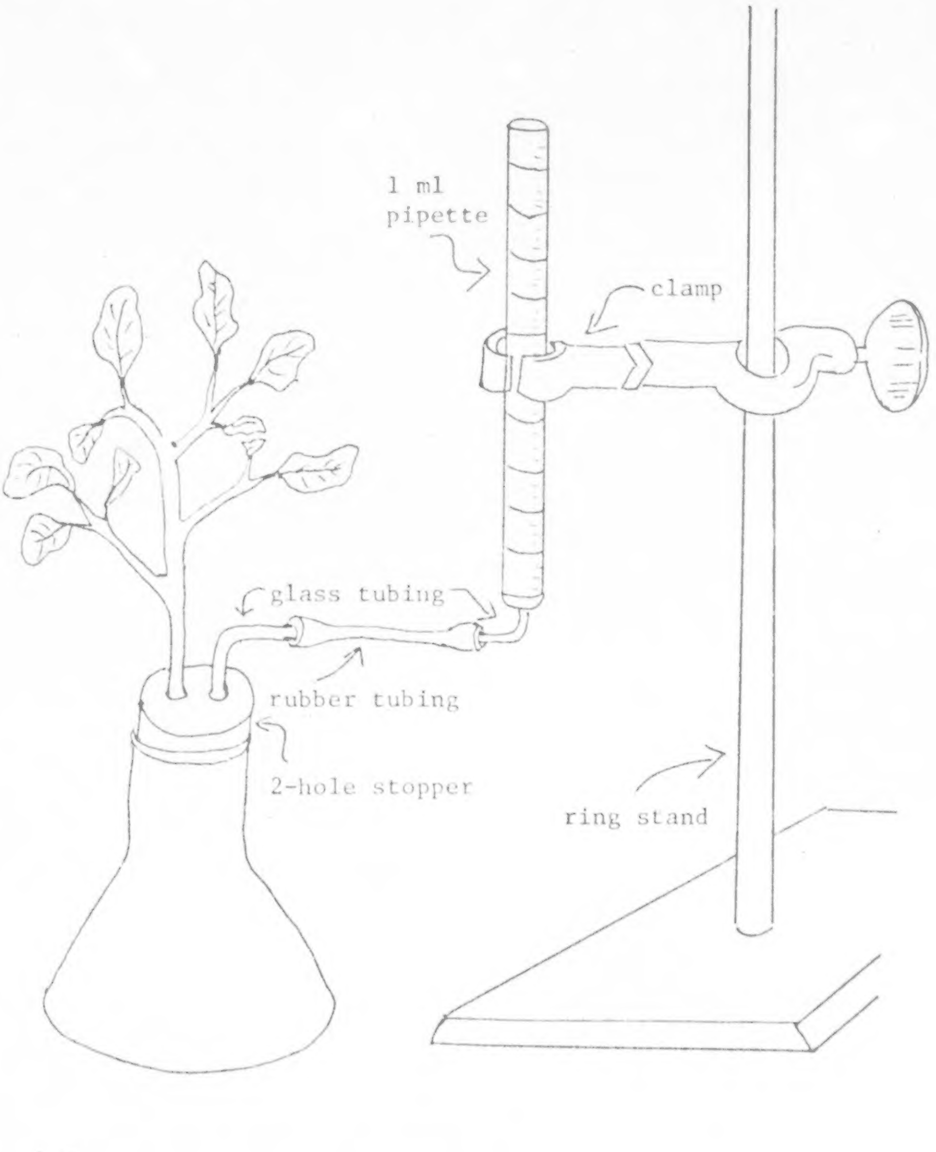
1 ml
pipette
clamp
glass tubing
rubber tubing
2-hole stopper
ring stand

Apparatus for Measuring Transpiration

PURPOSE: To understand the principle by which paper is recycled.

LEVEL: 4-6
7-9

SUBJECT: Science

CONCEPT: III-4 Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: *Ecology Action Pack*, McDonald's Corporation, Oak Brook, Illinois 60521. 1973.

ACTIVITY: While recycling paper commercially requires huge machines and elaborate production lines, the basic steps of paper recycling can be done in the classroom or as a home project. Materials needed are: an old newspaper, mixing bowl, egg beater, wood block about 2 x 3 inches in size, a piece of window screen about 4 x 4 inches, a plastic sandwich bag, wallpaper paste or cornstarch, water, and a tablespoon. Directions:

1. Fill the bowl 1/4 full of water. Tear a half page of newspaper into tiny pieces. Place the pieces in the bowl and let them soak for at least one hour.

2. After the paper has become thoroughly soaked, beat it with an egg beater until the paper is broken into fibers. When the mixture has been beaten adequately, it should have the creamy texture of paper pulp.

3. Dissolve two heaping tablespoons of wallpaper paste or cornstarch in a pint of water. Pour into the pulp and stir.

4. Hold the piece of window screen flat and lower it into the pulp. Do this repeatedly until you accumulate a layer of pulp about 1/16th inch thick.

5. Set the pulp-covered screen on a newspaper and place a plastic bag over it. Press down with the wood block--gently at first, then with more pressure. The water will filter or be forced through the screen onto the newspaper.

6. Allow the fibers to dry for about 24 hours. Peel the fibers, now paper, from the screen.

PURPOSE: To show the effects of overcrowding.

LEVEL: K-3
4-6
7-9

SUBJECT: Science

CONCEPT: I-4 In any environment, one component--like space, water, air, or food--may become a limiting factor.

PROBLEM: IV-6 Eco-Community Relationships--population studies.

REFERENCE: Mary Rea, Dublin, Ohio, Middle School Teacher.

ACTIVITY: Divide the class into small groups. Each group should obtain or be given five flower pots or other small planting containers. The containers should be filled with soil from the same source and labeled A, B, C, D, and E. Plant in the containers widely differing numbers of one kind of seed such as radish, tomato, or corn. Geometric ratios such as the following might be used:

A = 2 seeds
B = 4 seeds
C = 8 seeds
D = 16 seeds
E = 32 seeds

Maintain all factors such as light, temperature, and moisture constant in all containers and make observations of growth that results during a period of 2-4 weeks.

What conclusions can be drawn about crowding and growth in plants? What does this mean to a gardener or farmer? Obviously, crowding affects plant growth. Does it also affect animal growth? How might it have the same results? How would it be different?

PURPOSE: To understand how fertilizer affects aquatic life.

LEVEL: 4-6
7-9

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-9 Eco-Community Relationships--fertilizers and pesticides.

REFERENCE: Resource Materials on Conservation and Ecology - Independence Outdoor Laboratory, Charlotte, N.C. 28212.

ACTIVITY: Divide the class into groups of 2-4. Each group should obtain a one-gallon widemouth jar and fill it with pond or stream water known to contain some "little critters." Each group should try to get its water sample and 1-2 cm. of pond or stream bottom ooze from a different source.

In the classroom or laboratory, each group should verify through microscopic examination and use of an appropriate biology "key" that its sample contains organisms such as protozoa, hydra, rotifers, nematodes, diptera, and copepod.

If organisms are present, the group should divide the water sample and ooze into two glass containers. Into one, add a "pinch" of garden fertilizer. Examine microscopically and by gross visual inspection the contents of each jar over a period of several days to see if the fertilizer affected the number of organisms.

What is the cumulative effect of this phenomenon on streams and lakes? Is it generally good or bad? What can, or should be done about it?

PURPOSE: To obtain an estimate of an animal population.

LEVEL: 7-9
10-12

SUBJECT: Science
Mathematics

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-6 Eco-Community Relationships--population studies.

REFERENCE: Allegheny County Outdoor School, Cumberland, Maryland 21502.

ACTIVITY: When dealing with animal populations which can be easily trapped, an accurate estimate of the population can be obtained by using a ratio method. An example of how to use this method is given below with grasshoppers being the population under study.

Select a grassy field where grasshoppers can be collected with sweep nets. Have the students collect as many grasshoppers as they can in the time available; at least 50 should be collected, but the larger the number, the more accurate the results will be.

Mark each grasshopper collected by placing a dab of nail polish or paint on its thorax. Count and release back into the field the marked grasshoppers.

On the following day, again collect as many grasshoppers as possible from the same field. Count the total number of grasshoppers collected on the second day. Then count the number of those collected which are marked with paint.

Now you can estimate the total population of grasshoppers in the area with the following ratio:

$$\frac{P}{C_1} = \frac{C_2}{M}$$

P = Total Population.
C_1 = Number caught and marked on first day.
C_2 = Total number caught on second day.
M = Number of marked grasshoppers caught on second day.

PURPOSE: To investigate stream velocity.

LEVEL: 7-9

SUBJECT: Science
Mathematics

CONCEPT: IV-1 Organisms and environments are in constant change.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Teacher Resource Booklet," Project ECO, Ames Community Schools, Ames, Iowa 50010.

ACTIVITY: Students can measure the velocity of a stream by placing two tall sticks in the middle of the stream; position the sticks 5 meters apart. (Shorter distances may be used if the stream is not straight at the site of measurement.) If the current is too swift to allow the sticks to stand up, then place the sticks along the bank of the stream. Toss a small rubber ball into the water upstream from the measuring station. Using a stopwatch (if possible) or a wrist-watch with a sweep second hand, measure the time lapse as the ball passes between the two sticks. Record the data in meters/seconds.

Do the investigation in several locations--mainstream, stream edges, bend of the stream, rapids. Data can be correlated with depositing of sediments (e.g. buildup of sand bar along inside of bend), number and types of organisms found in various currents.

The velocity data may also be used to calculate the volume of water passing a given point per unit time. To do this, find the width of the stream and the average depth (by taking a series of depth readings). Calculate volume by using the distance between the measuring sticks, the width at measuring site, and the average depth.

PURPOSE:	To measure and graph water temperatures in ponds or streams.
LEVEL:	4-6 7-9
SUBJECT:	Science Mathematics
CONCEPT:	IV-1 Organisms and environments are in constant change.
PROBLEM:	IV-1 Eco-Community Relationships--ecological considerations.
REFERENCE:	"Teacher Resource Booklet," Project ECO, Ames Community Schools, Ames, Iowa 50010.

ACTIVITY: This investigation lets the students collect data over a period of time in one or more aquatic communities; use of thermometers, graphing, and data interpretation allows the students to gain experience in several areas.

Select a pond and/or stream (preferably both so comparison may be made) near the school site so visits can be made several times a day. Use Celsius (centigrade) thermometers to measure surface and subsurface temperatures in shade and direct sun. Subsurface temperatures should be taken at 20 cm. intervals by securing the thermometer to a meter stick or weighting it on a premeasured length of string. Allow the thermometer to remain at the desired depth for several minutes, then bring it quickly to the surface and read the thermometer before the air affects the reading. Data should be compiled in graph form.

Comparative studies can be conducted using data collected at several times during the day, in addition to comparing data from shade and direct sunlight, from pond and stream, from air temperature and water temperature. The metric system may be stressed and conversion techniques used.

PURPOSE: To become more aware of the beneficial results of selective breeding of animals and plants.

LEVEL: 7-9
10-12

SUBJECT: Science
Social Studies

CONCEPT: III-4 Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: IV-7 Eco-Community Relationships--species control (non-human).

REFERENCE: Man and His World. Contemporary Social Science Curriculum, Silver-Burdett.

ACTIVITY: Involve the class in identifying the foods most commonly used to feed the world's population. The list would undoubtedly include wheat, corn, rice, soybeans, various vegetables, fruits, milk, beef, pork, chicken, fish, and other foods.

Raise with the class questions concerning the historical origins of the plants and animals on which we are so dependent. Did the wheat plant always look like it does today? Do we have different types of wheat for different climates? Do we now get larger yields per acre? Why? Similar research can be done and reported on other plants.

Other students might research the many kinds of dairy and beef cattle that have been developed through selective breeding from a common bovine ancestor. How much, for example, have we been able to increase milk production per animal?

Are there limits to increasing food production by these methods?

Specialists from colleges of agriculture or a trip to an agricultural experiment station might be useful in introducing or culminating such a study.

PURPOSE: To understand the energy subsidies required to produce various food.

LEVEL: 7-9
10-12

SUBJECT: Science
Social Studies

CONCEPT: I-1 Living things are interdependent with one another and their environment.

II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

IV-4 Eco-Community Relationships--energy production.

IV-12 Eco-Community Relationships--effects of humans on ecosystem.

REFERENCE: *Energy: Sources, Use, and Role in Human Affairs*. Carol and John Steinhart, Duxbury Press, North Scituate, Mass. (1974).

ACTIVITY: Review with the class the general concept that energy (human, animal, chemical, etc.) is required to produce food crops. Have them speculate regarding which foods require much "energy" to produce. Are these the foods that also give much energy when man uses them?

After exploratory discussion along such lines make available for class study the figure shown below. What does it show? What crops or types of agriculture require least energy? Are such crops and types found predominately in the U.S.A. or elsewhere? Why?

What types of food require the biggest energy subsidy? Why? What does the figure indicate to be the relationship between specific food costs and energy costs? Might this relationship result in future changes in American eating habits? What might they be?

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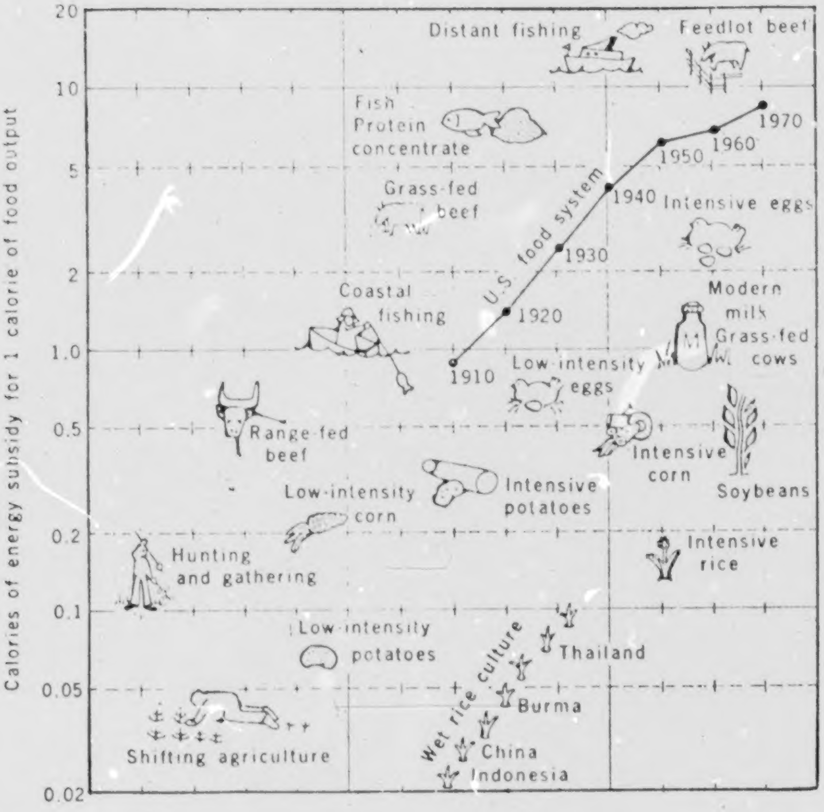

Energy subsidies for various food crops. The energy history of the U.S. food system is shown for comparison.

PURPOSE: To become aware of chemical dangers in the environment.

LEVEL: 7-9
10-12

SUBJECT: Science
Social Studies

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: II-2, 3, 5 Health Considerations--radioactivity; air quality; food quality.
III-2 Genetic Considerations--chemicals.

ACTIVITY: Develop with the class a list of "pollutants" that Americans now ingest through nose, mouth, or skin. The list should include such things as sulphur dioxide, carbon monoxide, cancer-causing hydrocarbons, lead compounds, DDT, aerosol can substances, radiation sources such as Strontium 90 and Iodine 131. Ask students to do independent or small group research on some of the pollutants. Where do they come from? Why were they developed? Are they inevitable and necessary in a modern technological society? Does the good associated with these substances outweigh the bad?

Involve the class in discussing the importance of the findings secured by student library research on selected pollutants. Discuss the concern of many scientists about the possibility of genetic damage resulting from chemical and radioactive pollution of our bodies. React to the statement, "Our generation may have performed a cruel experiment on succeeding generations."

PURPOSE: To become aware of sediment carried from various types of ground covers and the problems associated with stream and reservoir sedimentation.

LEVEL: 7-9
10-12

SUBJECT: Science
Social Studies

CONCEPT: III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Teaching Soil and Water Conservation," U.S. Department of Agriculture, Publication PA-341.

ACTIVITY: Secure several tall, narrow bottles, such as those in which olives are sold. After a heavy rain, have different students collect a bottle full of water from different streams. One stream, for example, might come from a cultivated field, another from a good pasture, another from a woodland, another from a housing project or other development under construction. Label each sample, place side by side in the classroom and observe the amount of sediment that settles out during a few days.

Encourage the class to discuss the importance of topsoil to the farmer. What harm is done by heavy sedimentation of streams? How is storage capacity of reservoirs influenced? How are fish affected? Are floods related to stream sedimentation? How does sedimentation cost the taxpayer? What can be done by individuals or government agencies to reduce the problem?

PURPOSE: To understand how sanitary landfills are made.

LEVEL: 4-6
7-9

SUBJECT: Science
Social Studies

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: II-1 Health Considerations--disease control - breeding ground control.

IV-2 Eco-Community Relationships--land use.

REFERENCE: Teacher's Guide, Filmstrip and Tape "Garbage Pollution Has a Solution: The Sanitary Landfill." Instructional Media Division of Monterey County Board of Education, P. O. Box 851, Salinas, California 93901.

ACTIVITY: Plan to take a field trip to a large sanitary landfill operation. Prior to going involve the class in considering the variety and amount of substances that are thrown away daily by the typical American family. Is trash disposal a problem in both rural and urban areas? Can they cite personally known examples? Is garbage disposal less of a problem in rural areas? Why? What dangers are associated with trash and garbage disposals on open dumps?

After discussion on such questions have the class view and listen to the filmstrip-cassette tape presentation on sanitary landfills cited in the reference above. Compare the ideas generated by the class with those presented in the filmstrip-tape presentation. Is the problem in California similar to the one in their community? Why or why not?

Finally, visit an operating landfill in the community and compare its operation with that depicted in the filmstrip. Account for differences, if any.

Can they suggest waste disposal practices that are preferable to sanitary landfills?

PURPOSE: To become more aware of ecological interactions.

LEVEL: 4-6
7-9
10-12

SUBJECT: Science
Language Arts

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: Teachers Curriculum Guide For Field Ecology. Brevard County (Florida) School System.

ACTIVITY: In a basically natural setting such as a park, wooded area, meadow, or on the bank of a stream, ask a student to sit quietly alone for 20-30 minutes.

During this time, he should be instructed to do something such as:

1. Listen for sounds and record in a notebook all sounds that he hears. He should also attempt to identify the source of all sounds heard.
2. Record all smells that he can sense. Try, again, to identify the source of each.
3. Record all that is seen. While sitting quietly he may see interesting activities of birds, insects, and larger animals. Suggest that students look for examples of interactions between animals or between animals and plants.

After returning to the classroom, ask the students to write a paper in which they summarize or create a story about what they heard, smelled, and saw. Did they like the experience? Why, or why not? What traits are necessary to be a good naturalist?

The activity might be repeated in a basically man-made environment such as along a city street, in the foyer of a large building, or on a bus. Again, the students could be asked to record what they see, hear, or smell and look for interactions between organisms or between organisms and their environment.

After returning to the classroom, students could write summary or reaction papers and evaluate the experience. They might also be asked to explain why they preferred studying the natural or man-made environment.

PURPOSE: To become aware of local precipitation patterns and variations.

LEVEL: 4-6
7-9

SUBJECT: Mathematics
Science

CONCEPT: I-4 In any environment, one component - like space, water, air, or food - may become a limiting factor.

PROBLEM: IV-8 Eco-Community Relationships--weather.

ACTIVITY: Obtain from the local weather bureau weekly or monthly rainfall data for the past 25-40 years. Provide each student or group of two students with the data for one year. Provide standard size graph paper or have the class agree on a common scale to be used and request each student to graph the weekly or monthly rainfall for his particular year.

Following the preparation of graphs for the separate years involve the class in preparing another graph that shows lowest, highest, and mean precipitations for the years, months and/or weeks they have used.

How much variation was found? What months or weeks are driest? Wettest? Does the precipitation occur when needed for plant growth? What is the "ideal" time, rate, and amount of precipitation for various plants? Does rainfall follow a cyclical pattern? What, if anything, can man do to influence this pattern?

PURPOSE: To review some problems associated with petroleum distribution in the world.

LEVEL: 7-9
10-12

SUBJECT: Mathematics
Social Studies

CONCEPT: III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

ACTIVITY: Involve the class in identifying the countries they regard as leaders in developing modern technology. Develop with the class a second list of countries they have learned or believe to be the largest petroleum exporting countries. Finally, ask them to identify the two countries in the world that have the largest populations.

Present, on a worksheet or by use of an overhead transparency, oil production and population data included in this activity. Challenge students to prepare, individually or in small work groups, graphs or charts that will show dramatically the disparity among countries in terms of total and per capita production.

Discuss the problems associated with this condition. What solutions are possible or likely? Is this a problem of greatest concern in the U.S.A. or in some other countries? Why?

Country	Oil Production* (42-gallon barrels)	Population*
United States	3,455,000,000	210,000,000
USSR	2,895,000,000	250,000,000
West Germany	51,000,000	62,000,000
France	11,000,000	52,000,000
Japan	5,000,000	107,000,000
United Kingdom	607,000	56,000,000
Saudi Arabia	2,202,000,000	8,000,000
Iran	1,840,000,000	31,000,000
Kuwait	1,201,000,000	910,000
Venezuela	1,178,000,000	11,000,000
Libya	819,000,000	2,000,000
India	57,000,000	560,000,000
China	216,000,000	800,000,000

*Data from 1974 World Almanac.

PURPOSE: To become aware of the rapid growth of American cities.

LEVEL: 7-9
10-12

SUBJECT: Mathematics
Social Studies

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: V-1 Psychological and Behavioral Considerations--crowding.

ACTIVITY: From some book of facts such as the World Almanac, secure and present to the class the growth pattern, since 1900, of 10 of the largest American cities.

Ask students individually, or in groups of two or three, to graph the rate of growth of these cities. Follow up the actual graphing with discussion-speculation as to why the rates vary so widely. Also try to explain factors responsible for the growth of each city. Does there appear to be a nation-wide trend? Why? What is their projection for future growth of American cities?

City	1900 Population*	1970 Population*
New York	3,400,000	7,900,000
Chicago	1,700,000	3,400,000
Los Angeles	100,000	2,800,000
Philadelphia	1,300,000	2,000,000
Detroit	300,000	1,500,000
Houston	45,000	1,200,000
Baltimore	500,000	900,000
Dallas	43,000	800,000
Washington	300,000	800,000
Indianapolis	200,000	700,000

*Rounded to nearest 100,000.

PURPOSE: To study the nature of passenger car traffic flow.

LEVEL: 4-6
7-9

SUBJECT: Mathematics
Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: V-2 Psychological and Behavioral Considerations--social aspects.

ACTIVITY: Ask the class to work in teams of two to collect data on the number of passengers riding in automobiles that are going different directions across a busy intersection. Record the number of passenger automobiles carrying only one, two, three, four, or more passengers. Record either for a specified time or until a certain number of cars, such as 100, have been recorded. Ask each team to calculate percentages of cars with different numbers of passengers. If possible, repeat at a significantly different time of day.

In class, have each group enter its data into a large table for the purpose of developing a more reliable sample and sounder conclusions.

Discuss questions such as: Does direction of traffic flow seem to make a difference? Why? Does time of day make a difference? Were you surprised at the results? Did you get evidence to support the idea that people are forming car pools to save gasoline?

PURPOSE: To appreciate the relationships between recreation and environment.

LEVEL: 7-9

SUBJECT: Social Studies

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: I-11 Aesthetic Considerations--recreational facilities.

REFERENCE: Man and His World. Contemporary Social Science Curriculum, Silver-Burdett.

ACTIVITY: Develop on the chalkboard a list of the favorite recreational activities of class members. The list is likely to include such things as watching TV, fishing, basketball, baseball, hiking, going to the movies, swimming, hunting, bowling, and others.

If possible, assign two or three children to work together "researching" the activity they have identified as their favorite. To what extent is their recreation dependent on "natural" or "man-made" environment? Is their recreation presently better or worse than it was when their parents or grandparents were young? What changes for better or worse do they see coming in the future of their recreation? To what extent is their activity dependent on outside energy or other people rather than upon themselves alone? Is their recreation something equally available to all, regardless of family income?

PURPOSE: To survey recreational preferences and opportunities.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: I-11 Aesthetic Considerations--recreational facilities.

V-3 Psychological and Behavioral Considerations--cultural considerations.

ACTIVITY: Develop with the class a list of recreational activities that rely primarily on the national environment such as fishing, hiking, hunting, canoeing, and mountaineering. Develop another list that uses primarily a man-made environment; i.e. bowling, reading, attending movies, basketball, and joy-riding in automobiles. Try to make each list comprehensive enough to include all activities commonly engaged in by class students and their families.

Using a questionnaire developed from these lists ask each class member to interview at least two young, two middle aged, and two older persons to find out (1) their preferences, if any, of recreational activities from each list and (2) their actual participation in the activities of their choice.

After collecting data discuss differences between preferences and participation. Are some too costly? Are some facilities inadequate? Are some deemed too dangerous?

Invite an official of the city or county recreation board or comparable agency to come to class and react to what has been found. Ask him to review the plans being made to provide additional facilities and programs. Review with him what might be done to help by groups such as the class. If possible, conclude the study with some kind of service activity in which class members actually improve some aspect of the community's recreation program.

PURPOSE: To identify and locate open space recreation areas in the community. To survey public awareness and use of these facilities.

LEVEL: 4-6
7-9

SUBJECT: Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: I-11 Aesthetic Considerations--recreational facilities.

REFERENCE: Environmental Pollution Education - Curriculum Resource Guide. St. Joseph's Calumet College, East Chicago, Indiana.

ACTIVITY: Provide each student with a map (topographical-political if possible) of a sizeable community area such as a county. As a homework or over-the-weekend assignment, ask each student to use his parents or siblings as resource persons to locate the open-space recreation areas they know about. They may also indicate the ones they have visited personally.

Invite to the class someone from a Metropolitan or County Park Board to help locate on a large map all areas identified by the students. This person could identify other areas not named or known to the students. He may also indicate areas receiving excessive or very little use.

Students might develop a questionnaire to ascertain the extent to which a sample of students and adults in their school's attendance area know about and use the open-space recreation areas available to them. Discussion of data obtained could include: Are the facilities adequate? Are they advantageously located? Are they well kept? Who pays for them?

PURPOSE:	To sense relationships between recreational activities and energy usage.
LEVEL:	4-6 7-9 10-12
SUBJECT:	Social Studies
CONCEPT:	II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.
PROBLEM:	IV-3 Eco-Community Relationships--natural resource use.
REFERENCE:	Energy and Man's Environment. Elementary Through Secondary Interdisciplinary Activity Guide, Education/Research Systems, Inc., 2121 Fifth Avenue, Seattle, Washington 98121.

ACTIVITY: Ask the students to work in groups of three and develop a chart in which they (1) list all of the common recreational activities they can think of, (2) name the kinds of energy needed to engage in each recreational activity, (3) judge the extent to which each activity is healthful or harmful, (4) estimate how popular each recreational activity is in their community, state and nation, and (5) the extent of their personal interest in each activity. Ask each group to be creative in designing the chart or table so it can include easily all of the judgments requested.

Summarize the material developed by the small groups in a large matrix on the chalkboard, or large sheet of paper, and discuss the results.

Do spectator sports such as football require much energy? What kind? How would they rate a major sporting event such as the Indianapolis 500-Mile Auto Race? How would they compare tent camping with vacationing in a mobile home? What is their judgment about the desirability of sporting arenas such as the Astrodome?

Is the general pattern of recreational activity in America geared to high energy use? If so, what can and/or should be done about it?

PURPOSE: To consider factors involved in determining land use.

LEVEL: 7-9

SUBJECT: Social Studies

CONCEPT: III-3 Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: IV-2 Eco-Community Relationships--land use.

REFERENCE: Cora Edwards, Columbus, Ohio, Junior High School Teacher.

ACTIVITY: Develop with the class a hypothetical situation in which a large commercial or industrial area in a city--such as a shopping center or enormous factory--has been "wiped out" by some catastrophe. The question now arises as to how the available space should be used in future rebuilding.

Ask each student to interview 5-10 persons in the community who represent different types of persons who work, live, and visit in the community under study; e.g., business owners, employees, residents, older shoppers, children, lawyers, optometrists, etc.

During the interview the student should attempt to get the respondents preferences for future rebuilding and reasons behind the preferences. The student should also record judgments about the person's age, vocation, and level of education.

Involve the class in organizing their findings into a matrix in an effort to see what relationships, if any, are found to exist between land use preferences and different socio-economic and age factors. Attempt also to sense how different types of respondents feel about the idea of community planning for land use.

PURPOSE: To introduce the governmental framework for recognizing and solving ecological problems.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: III-4 Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: V-2 Psychological and Behavioral Considerations--social aspects.

REFERENCE: Hershey, John T. *et al*. *A Curriculum Activities Guide to Water Pollution and Environmental Studies*. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: This activity is to introduce students to governmental structure on a state and local level. As a result of this activity, the student should know where to go in his local or state government to deal with environmental problems. The students should develop a schematic diagram to display the governmental office breakdown.

This activity may be done in conjunction with the study of a pollution problem and the collection of field data to demonstrate the existence of that problem; or a particular pollution problem may be pointed out by the teacher and data collected through news reports and articles. Once the problem is identified, students should obtain information concerning state laws and agencies which are concerned with such a problem. Local lawyers and elected officials may be invited to discuss the matter with the students. Student groups can be organized to consider areas such as the relationship of federal and local agencies; the operative efficiency of state commissions; state, federal, and local laws dealing with pollution; the social aspect of pollution; and many more.

PURPOSE:	To understand the problems inherent in making political decisions about environmental matters.
LEVEL:	7-9 10-12
SUBJECT:	Social Studies
CONCEPT:	II-2 The relationships between man and the natural environment are mediated by his culture.
PROBLEM:	I-4 Aesthetic Considerations--litter.
REFERENCE:	John Sauer, Columbus, Ohio, Junior High School Teacher.
ACTIVITY:	Create with the class a role-playing situation in which a subcommittee of the State Legislature has been designated to write legislation to prohibit the use of non-returnable beverage bottles.

Ask for volunteers (or draft) students to represent, as lobbyists, "pressure groups" that have a special interest in the proposed bill. These might include such groups as supermarket owners, bottle manufacturers, can manufacturers, landfill operators, ecologists, and "concerned citizens."

Ask the lobbyists to prepare a 3-5 minute presentation regarding their views on the proposed legislation to the subcommittee of 5-7 students. The legislators, of course, should have the opportunity to question lobbyists about their statements or positions.

The next day, the subcommittee should meet again in front of the class to draft the proposed bill. When the bill is drafted, involve class members in considering the arguments advanced by the lobbyists and the "fairness" of the draft proposal. What do they believe personally about the need for legislation in this area?

PURPOSE: To understand how transportation affects population growth.

LEVEL: 4-6
7-9

SUBJECT: Social Studies

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: IV-6 Eco-Community Relationships--population studies.
V-2 Psychological and Behavorial Considerations--social aspects.

REFERENCE: "A Supplementary Program for Environmental Education--Science," Project I-C-E, 1927 Main Street, Green Bay, WI 54301.

ACTIVITY: This activity is used to help students decide why people settle in a particular place. An emphasis may be placed on the transportation of people and goods into and out of an area.

Give each student several outline maps of the state where he lives. If possible, use maps that show variations in population, rainfall, growing season, and economic activities. These, or similar maps, may be available through your State Department of Natural Resources or U.S.D.A. Agriculture Extension Service. The students may want to color in their maps, using a different color to show variations in one factor. How are the several factors interrelated?

List the 5 or 10 largest cities in your state. Have the students locate them on their maps. Why are the cities located in that particular spot? Is there a river or lake nearby? What forms of transportation come into the areas today? Was this different when the cities were first settled?

PURPOSE: To understand more fully the factors that influence the distribution of population in a state or nation.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: V-2 Psychological and Behavioral Considerations--social aspects.

REFERENCE: Environmental Pollution Education - Curriculum Resource Guide. St. Joseph's Calumet College, East Chicago, Indiana.

ACTIVITY: Develop, through discussion with students in the class, a list of factors that determine where people live. Starting with their own families, the list will likely include such things as:

1. Where work is available.
2. Where our family has lived for several generations.
3. Where good education is offered.
4. Where recreation is available.
5. Where the climate and weather are good.
6. (Students can suggest other reasons.)

Using the factors identified, have the class explain the enormous size of cities such as New York, Chicago, Los Angeles, and the small size of cities or villages in your area.

Discussion may evolve regarding the "optimum size" of a city. Can cities get too large? Why, or why not? What, if anything, might be done to discourage growth of already enormous metropolitan areas?

PURPOSE: To understand more fully the advantages and disadvantages of city living.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

REFERENCE: Man and His World. Contemporary Social Science Curriculum, Silver-Burdett.

ACTIVITY: Develop with the class a list of the reasons why people move from rural areas to the city. The list will include such factors as better jobs, better schools, better health care, more excitement, more entertainment, and others. Are these expectations of rural families moving to the city actually realized? View some selected films on problems of city life and engage the class in discussion of the lifestyle of various socio-economic groups that live in cities. Are jobs better in cities? Are schools better? Is better health care available? And so forth. Is it possible that cities are "great places to visit" but terrible places to live in? Is it possible that poverty is worse in big cities than in rural areas?

If cities are growing too large for their own good, what can be done to correct this condition? What can be done by individuals, cities, states, or national governments?

PURPOSE:	To discover how "waste" materials are made useful.
LEVEL:	K-3 4-6 7-9
SUBJECT:	Social Studies
CONCEPT:	II-2 The relationships between man and the natural environment are mediated by his culture.
PROBLEM:	IV-3 Eco-Community Relationships--natural resource use.
REFERENCE:	"A Supplementary Program for Environmental Education--Social Studies," Project I-C-E, 1927 Main Street, Green Bay, WI 54301.

ACTIVITY: This is a study of how items that were once considered to be waste materials are now products in demand. The activities should be generated by the class through the teacher's guidance.

As the class winds up a project and begins to dispose of the material gathered for the project, begin a discussion on what happens to waste material and how can it become a useful material again.

While discarding waste paper, begin a discussion of paper recycling. Visit a print shop and a recycling center. Try to determine how much paper is thrown away in a day in your class, in your school. Calculate this in terms of dollars and cents. How much does it "cost" to recycle paper.

The study of sawdust is a fun unit. Sawdust was once a waste product but is now in demand for sweeping compounds, particle board, paper manufacture, and other products. A trip to a sawmill might be of interest here.

PURPOSE: To find how man's demands on the environment bring about change.

LEVEL:
4-6
7-9
10-12

SUBJECT: Social Studies

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: IV-5 Eco-Community Relationships--urban planning.

REFERENCE: "Elementary Science Guide," Division of Elementary Education, State Department of Education, Richmond, VA 23216.

ACTIVITY: Have the class visit several areas in the city where the human population is on the increase. Observe the changes in land use, the number of new buildings, the number of apartments versus the number of single family dwellings, the amount and type of materials being used. What kinds of demands are made upon the environment in relation to the life needs of the residents? Will more shopping areas be needed? Is the land available for shopping centers? How will traffic patterns in the area be affected? Check with local officials about increasing water and power consumption, solid waste disposal problems, and land erosion. Are any plans being made to maintain a natural or open-space area? Is this important?

Develop alternate solutions to the problems of the increased population and hypothesize the results of the solution.

If you had control of the land in the area before the sudden influx of people, how would you change the way it has developed?

If you could control the development of a new residential area which of the two plans shown on the next page would you prefer? Why? Try to explain why one of the plans is used so much more often than the other.

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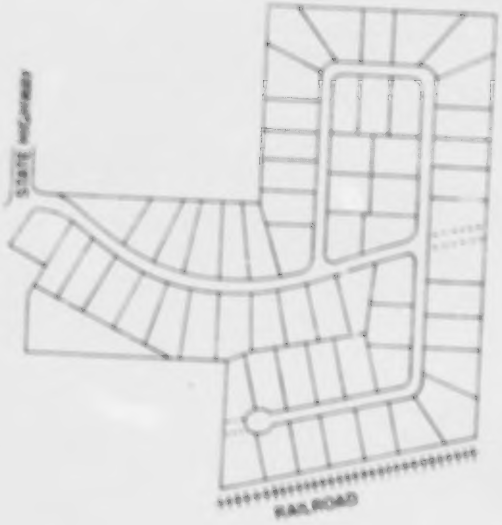
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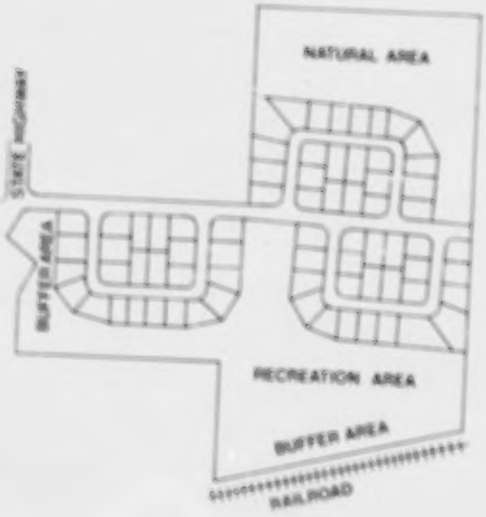
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BUFFER AREA
RECREATION AREA
BUFFER AREA
RAILROAD

PURPOSE: To use building structures to interpret the cultural history of the area around the school.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: IV-5 Eco-Community Relationships--urban planning.

REFERENCE: "Some 'Around the School Yard' Activities," U.S. Forest Service, Portland, Oregon.

ACTIVITY: Have the students inventory building structures within a given distance of the school or between the school and the students' homes. It may be possible to draw or obtain a map of the area; locate students' homes on the map and the buildings studied.

Develop a classification system for types of buildings--shape, roof shape and type, materials used in construction, etc.

Develop a classification for age of buildings. Map the vacant buildings in the area and determine how long they have been out of use. What was their original use? What factors caused the building to become vacant?

Make an inventory of fences in the area. What material was used to build them? What types of fence are they?

From your inventories, can shifts in population be observed? Is the business in the area changing? What factors are affecting growth in the area? How are traffic patterns affecting the area?

PURPOSE:	To consider policy and advertizing of the petroleum industry.
LEVEL:	7-9 10-12
SUBJECT:	Social Studies
CONCEPT:	II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.
PROBLEM:	IV-3 Eco-Community Relationships--natural resource use.
REFERENCE:	Environmental Conservation. A Report of the National Petroleum Council's Committee on Environmental Conservation--The Oil and Gas Industries, 1625 K Street, N.W., Washington, D.C. 20006, 1971.
ACTIVITY:	Involve the class in a very careful analysis of the position taken by the National Petroleum Council in the Summary-Conclusion statement quoted below. What assumptions are made? Do the conclusions follow logically? Are assumptions and conclusions clear or ambiguous? Cite specific examples.

Ask a few interested students to collect over a period of a few weeks from magazine sources such as Time, Newsweek, National Geographic and comparable publications the advertisements of the major petroleum and gas companies. Have students compare the message of current advertisements with the 1971 position. Do they stress the same things? If not what accounts for the change? Are the advertisements convincing or alienating to you? Why?

SUMMARY CONCLUSION

It is the conclusion of the National Petroleum Council, an industry advisory body to the Secretary of the Interior representing virtually the entire American oil and gas industries, that these industries are conscious of their significant responsibilities for environmental conservation and are sincerely dedicated to a continuing and effective approach to the solutions to those environmental problems which lie within their purview.

The oil and gas industries are well aware of the environmental problems resulting from the conduct of their various operations of production, refining, storage, transportation and marketing of products, and also outside these industries, from the use of their products. Real progress has been made in defining these problems and developing solutions to them, but, nevertheless, problems remain. Continuing progress will be required to improve standards and to develop more advanced technology and better operating practices and equipment to achieve improved environmental quality.

The oil and gas industries face a requirement to provide to the society of which they are a part vital energy in a manner consistent with environmental conservation, recognizing that the costs involved are those of society. We are confident that these industries will continue to do their part, including full cooperation with government and with the general public which they serve, so that the requisite environmental standards can be developed and met, consistent with providing the nation with its necessary energy.

PURPOSE: To understand how modern machinery influences land usage.

LEVEL: 4-6
7-9

SUBJECT: Social Studies
Science

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: IV-2 Eco-Community Relationships--land use.

ACTIVITY: Review with the class the philosophic principle that possibly man should try to establish a harmonious relationship with his natural environment. Consider with the class the recent historical development of bulldozers, power shovels, and other powerful earth-moving equipment. Review how they are used to level hills, fill in valleys, change shallow water areas into apartment building sites, etc. Ask each class member to jot down, if he can, five beneficial and five harmful results of the bulldozer and other comparable earth-moving equipment.

Pool the items and determine those most commonly cited as positives and negatives. Discuss specific examples in the community or country where benefits seem to be maximized and costs minimized.

Should the people, as represented by their government, have anything to say about how bulldozers, etc., can be used on private land? Why, or why not?

PURPOSE: To investigate changes in food production and preparation.

LEVEL: 7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: II-5 Health Considerations--food quality - pesticides, additives

V-3 Psychological and Behavioral Considerations--cultural considerations

REFERENCE: The Ecological Citizen. Dirck Van Sickle, Harper and Row, 1971.

ACTIVITY: Review with the class their understanding of recent changes in food production and preparation. They will (or should) identify recent developments such as (1) tremendous growth in use of frozen foods, (2) boil-in-the-bag items, (3) freeze dried foods, (4) packaged foods such as snacks that need no preparation, and (5) single portion products. A list of major changes in production patterns such as (1) enormous "chicken farms" where hundreds of thousands of broilers are raised under artifical light, (2) tremendous feed-lots where beef-cattle are fattened for market (3) use of antibiotics in animal feed and (4) use of hormones to stimulate animal growth should also be identified.

Ask two or three students to work together to collect information about one of the recent developments. Through reading, field study, or interview consider questions such as: Has the development reduced the cost of food? Has it improved food quality? Who has benefitted from the development? Who, if anyone, has been harmed? Have any of the developments changed their family style of living? If the development likely to continue or accelerate in the years ahead? Why or why not?

Interviews with specialists in animal science or food merchandising should prove to be an interesting part of the study.

PURPOSE: To understand the value of using plant proteins.

LEVEL: 7-9
10-12

SUBJECT: Social Studies
Science (in Home Economics)

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: Jane Keathley, Columbus, Ohio, Senior High School Teacher.

ACTIVITY: Use the groupings normally used for food preparation activities. Each group should plan and prepare a main dish using commercially prepared vegetable protein meat substitutes that the teacher has obtained and mixed so that it is ready for use in casseroles, meat loaf, chili, or other appropriate dishes. Have the students prepare their dishes and evaluate the results with the assumption they are using "real meat."

The following day, review with the class the importance of protein in the diet. Involve them in understanding why animal protein must always, in terms of food chain loss, be more expensive than vegetable protein. Show the class boxes of meat substitutes such as those prepared by Creamettes or Worthington Foods and ask how many would like to use such products rather than meat. After some discussion, and likely rejection of the idea, inform them that they had actually used the materials in their previous food preparation.

Why do Americans prefer meat? Why do the Japanese and many other countries use so much vegetable protein? How much cheaper is vegetable protein? Why? Are there advantages to vegetable protein other than economy?

The discussion might be followed up by another food preparation when the students know that they are using, for example, a ground beef substitute to prepare spaghetti sauce for use in class. Is the sauce tasty? Does it really make much difference whether you use meat or the substitute?

PURPOSE: To understand problems associated with pet food use.

LEVEL: 4-6
7-9

SUBJECT: Social Studies
Science

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: IV-7 Eco-Community Relationships--species control (non-human).

ACTIVITY: Ask the students to bring to class labels from canned or packaged pet food. Hopefully twenty or more different labels can be obtained.

Involve students in categorizing on the chalkboard all of the substances listed on the various labels. How many contain cereal? Is the cereal source specified? How many contain meat? Is the meat source given? How many contain fish? Are vitamin and mineral enrichment substances used?

Challenge students to get from the school or community librarian some reliable information about the number of pet animals (particularly dogs and cats) in the U.S.A.

How expensive is it to feed such animals if they are kept in cities? Is it O.K. to kill whales or wild mustangs for pet food? Why or why not. Feed used for pets in America and other rich countries is unavailable to feed starving persons in very poor countries. Should this be of concern to us? Why or why not?

PURPOSE: To understand the importance of natural marshes and floodplains.

LEVEL: 7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

REFERENCE: *Teachers Curriculum Guide for Field Ecology*. Center for Environmental Education, Brevard County (Fla.) School Board, Cocoa, Florida 32922

ACTIVITY: Discuss with the class the concept that "natural marshes and floodplains act as biological waste treatment complexes that absorb and utilize excess watershed nutrients." Review the recent tendency to (1) eliminate marshes by filling (2) to speed stream flow by channelizing, and (3) to use dams and levees to guard against flooding on natural floodplains and to use such land for real estate developments.

Why should we be concerned with elimination of marshes? Should the power to drain a marsh or channelize a stream rest only with the owner of the land? Why or why not? Should real estate developments be permitted on known floodplains? Should government "disaster loans" be available to cover flood losses for homes in such locations?

After class discussion on such questions invite a proponent of channelization such as a spokesman from the U.S. Army engineers, Department of Agriculture, or a real estate developer to come to class and discuss his position on appropriate questions developed by the class.

PURPOSE: To study air pollution.

LEVEL: 7-9

SUBJECT: Social Studies
Science

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: II-3 Health Considerations--air quality.

REFERENCE: "Strand IV - Ecology and Health," Grades 7-9, Bureau of Secondary Curricular Development, State Education Department, Albany, NY 12224.

ACTIVITY: Obtain air pollution indices from the weather bureaus in several communities around your state. These reports should be daily pollution indices or monthly averages. Compare the data from several cities. How is the air pollution index determined? What effect does climate and terrain have upon the air pollution problem in these areas?

Have a local health official discuss the effects of air pollution upon human health.

How can local sources of air pollution be controlled? Is the community doing anything to effect a control? How do economic and social influences affect the air pollution problem? Consider the political influence in maintaining status quo for local industries.

PURPOSE: To explore the concept of "waste," its uses, misuses and abuses.

LEVEL: 4-6
7-9

SUBJECT: Social Studies
Science

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

REFERENCE: Doreen Uhas, Columbus, Ohio, Junior High School Teacher.

ACTIVITY: By touring the neighborhood, especially on garbage collection day, or by bringing in a day's worth of kitchen garbage in a clear plastic bag, students can try to answer questions as to why someone threw away what they did. Is there anything that might have been used again in another way? How much of it might not have been thrown away in another home or country? Do certain factors such as age, economic level, or ethnic origin enter into a disparity of more waste or less waste? What, in general, does a collection of garbage tell about our lifestyles and tastes?

Can students imagine what might be included if, for example, we examined a bag of garbage from a home in China? From California? From a farm? What do they think is the "best" way to dispose of garbage? Why? Why do we use many ways that aren't the best?

PURPOSE: To understand that deserts may be man-made.

LEVEL: 7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: IV-4 Man has been a factor affecting plant and animal succession and environmental processes.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

ACTIVITY: During a study of the geography and cultures of Asia Minor and North Africa raise questions with the class about what happened to the great civilizations that once flourished there. What happened to the once very productive Tigrus-Euphrates valley? What happened to agricultural lands surrounding ancient Carthage? What happened to the land when the Biblical Cedars of Lebanon were cut ruthlessly?

Involve the class in researching the importance of forests in moderating temperature and in holding soil on steep hillsides. Review what happens to irrigation projects when waterways become heavily silted. Raise questions about the damage to ground cover caused by overgrazing with sheep, goats, and cattle.

What evidence can be found to support the contention that deserts can be caused by man as well as by climatic changes? Is it possible to create deserts in the U.S.A.? Where? How? What can/should be done about this problem?

PURPOSE: To sense the enormity of the electrical appliance industry in the U.S.A.

LEVEL: 4-6
7-9

SUBJECT: Social Studies
Science

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

ACTIVITY: Involve students in building a list of electrical appliances in common use. The list will probably be started by students naming electrical refrigerators, stoves, fans, lights, radios, TV's, and so forth. After listing 20 or so items, ask the students to work individually or in groups of two or three to see how long a list they can develop. Their ultimate lists will likely include electric toothbrushes, record players, electric trains, grass clippers, and many many more. Suggest they use mail order catalogs, newspaper advertisements, and visits to department stores to get ideas.

Build with the class a master list of all electrical items identified by class members. Ask each child to vote on the importance of the item. Is it vitally necessary? Nice but not necessary? Strictly a luxury item?

Discuss the extent of agreement or disagreement on several items. How important is electricity in our "life style"? Might we be using too many electrical appliances and too much electricity for our own good? Why or why not?

PURPOSE: To understand the energy demands of fast-food operations.

LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: IV-4 Eco-Community Relationships--energy production.

V-3 Psychological and Behavioral Considerations--cultural considerations.

ACTIVITY: Involve the class in trying to explain the phenomonal growth of the fast-food industry in the U.S.A. during the past decade. Help students understand that large national operations such as McDonald's, Kentucky Fried Chicken, Arthur Treachers, Burger King, Arby's as well as large locally known drive-in eating places were unknown a few years ago. If feasible, arrange to take the class on an early morning field trip to such a place and have someone who knows the operation well explain how they can produce their meals so quickly. Give particular attention to the energy using equipment found.

Do they use frozen food? Do they have much refrigeration equipment? What other power appliances or equipment are found? Does it take more energy to prepare food in such a place than it does at home? Are such places trying to conserve energy? Why or why not?

Consider also the amount of energy used by people to get from homes to fast-food eating places. Have such places noticed any slacking-off of business as a result of increased gasoline costs? Do they anticipate a growing problem in this regard?

Projecting ahead what does the class believe will happen in the fast-food industry during the next 10-20 years. Will such growth as noticed in recent years continue or even accelerate? What assumptions and/or facts have they taken into account in reaching their prediction?

PURPOSE: To visualize planet Earth as a spaceship.

LEVEL: 7-9

SUBJECT: Social Studies
Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: _Man and His World_. Contemporary Social Science Curriculum, Silver-Burdett.

ACTIVITY: Involve the class in compiling a list of all things needed by astronauts during a prolonged flight in a space capsule or "sky lab." Compare this list with another one that includes all things needed by people here on earth.

What determines how many persons can go on a spaceflight and how long they can stay? Do these same factors determine how many people can live on the earth and for how long? Why, or why not? What precautions, if any, can or must be taken to assure that life on earth can go on "forever"?

PURPOSE: To become aware of organized group efforts to work on environmental problems.

LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

ACTIVITY: Ask for individuals or very small groups of students to take responsibility for drafting letters to organizations such as those listed below. Request information concerning purposes of the organization, size of membership, membership requirements, outstanding accomplishments, and other information available to publicize the organization.

Ask two or three students to review carefully the material received and to report their findings to the class. What kind of person joins the group? Is it a nationwide group? Is there a local chapter? Has the group been successful. What evidence can be cited? Would the group be interested in having students join?

If possible have a local member of such a group talk to the class to review their concerns and successes.

The Sierra Club
1050 Mills Tower
220 Bush Street
San Francisco, California 94104

Friends of Animals
11 West 60th Street
New York, New York 10023

The Wilderness Society
1901 Pennsylvania Avenue., N.W.
Washington, D.C. 20006

Friends of the Earth
72 Jane Street
New York, New York 10014

Zero Population Growth
1346 Connecticut Avenue, N.W.
Washington, D.C. 20036

Scientists Institute for Public Information
30 East 68th Street
New York, New York 10021

Planned Parenthood-World Population
515 Madison Avenue
New York, New York 10022

National Audubon Society
950 Third Avenue
New York, New York 10022

The Izaak Walton League
1841 South River Road
Des Plaines, Illinois 60016

The Conservation Foundation
1717 Massachusetts Avenue, N.W.
Suite 300
Washington, D.C. 20036

The Mother Earth News
P. O. Box 38
Madison, Ohio 44057

PURPOSE: To examine surface runoff and its relation to the hydrologic cycle.

LEVEL: 7-9
10-12

SUBJECT: Social Studies
Mathematics

CONCEPT: IV-1 Organisms and environments are in constant change.

PROBLEM: IV-2 Eco-Community Relationships--land use.

REFERENCE: Hershey, John T. *et al*. *A Curriculum Activities Guide to Water Pollution and Environmental Studies*. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: To examine surface runoff, select sites with a variety of slopes and substrata. Determine an area of 20 cm square and excavate a shallow trench on the downhill edge to collect the runoff; a dustpan or tray may be used as the collecting device. Measure the angle of the slope with a clinometer, Brunton compass, or homemade device. Pour one liter of water into a No. 10 can with holes (to simulate rain) while holding it over the delineated area. Collect and filter the surface runoff; measure the volume to get percent of runoff. Wait five minutes and repeat the process to find the effect of increased soil moisture.

Select and delineate an adjacent area or similar site with the same slope; repeat the process using a different intensity.

PURPOSE: To examine problems associated with use of recreational vehicles.

LEVEL: 7-9
10-12

SUBJECT: Language Arts

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: I-11 Aesthetic Considerations--recreational facilities.

REFERENCE: Energy and Man's Environment - Elementary Through Secondary Interdisciplinary Activity Guide. Education/Research Systems, Inc., 2121 Fifth Avenue, Seattle, Washington 98121.

ACTIVITY: Ask three small groups of students to prepare large poster board exhibits on (1) snowmobiles, (2) sand dune buggies, and (3) trail bikes. Suggest that they become knowledgeable about the cost of the vehicles, places where they are used in the state and nation, and the state laws governing operation of the machines.

Engage the class in discussion about the propriety of using these vehicles in view of their impact on the environment and the energy shortage. What useful purpose is served? What harm is done? Is this a "private" matter or one of community or state concern? What changes, if any, would they suggest be made in the manufacturing or use of such vehicles?

After a period or so of discussion on such questions, ask each student to develop, in writing, his position for or against the use of such vehicles in general and/or under different conditions.

PURPOSE: To help students critically read articles about the environment.

LEVEL: 7-9
10-12

SUBJECT: Language Arts

CONCEPT: III-3 Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: V-2 Psychological and Behavioral Considerations--social aspects.

REFERENCE: Hershey, John T. *et al*. *A Curriculum Activities Guide to Water Pollution and Environmental Studies*. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: Select several environmental articles which use statistics as a basis for persuading the reader to take a particular viewpoint. The articles may be from newspapers or magazines; all should reflect the reading ability and scientific background of the students. Articles taking opposing viewpoints would be of particular interest.

While reading the articles, the students should consider such questions as:

How reliable is the information in the article?

What is the source of the data? Is that source reliable?

Is pertinent data omitted?

Does the author stray from the subject?

After reading the article(s), have the students critique the material, backing up their views with examples. The students may wish to rewrite the material in an acceptable form. The same type of exercise can be done with written advertisements or television commercials.

A book which may be of use in this type of activity is *How To Lie With Statistics* by Darrell Huff (W. W. Norton & Co., 1954). The book is also available in paperback.

PURPOSE: To use student interest in ecology to develop language facility in French and German.

LEVEL: 7-9
10-12

SUBJECT: Language Arts

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: Minnesota State Department of Education, Capitol Square Building, St. Paul, Minnesota 55101; Wisconsin Department of Public Instruction, 126 Langdon Street, Madison, Wisconsin 53702.

ACTIVITY: Several state Departments of Education have produced curricular materials pertaining to ecology but written in a modern foreign language. Minnesota has produced such materials in French and German; these same materials are also available from the state of Wisconsin.

The Ecology Packets contain cartoons, activities, articles (one in German was originally written by Ralph Nader), plays, and much more--all written in a modern foreign language. New vocabulary is introduced as ecological concepts are taught. The student is made aware that ecology must be a world-wide concern as environmental action and problems in France and Germany are discussed.

PURPOSE:	To increase student concern for the school environment.
LEVEL:	4-6 7-9
SUBJECT:	Fine Arts
CONCEPT:	II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.
PROBLEM:	V-3 Psychological and Behavioral Considerations--cultural considerations.
ACTIVITY:	The fine arts teacher might involve his class in thinking about what they can do to improve the beauty of classrooms, halls, offices, lunchroom, and other areas in the school. Following the discussion each student could undertake to develop at least one project that will improve the school environment.

Obvious projects might include making ceramic objects for display in offices or showcases, paintings to be hung on bulletin boards or other appropriate places, eye-catching bulletin board displays that illustrate what is being studied in different classrooms, and making attractive signs to identify important places or transmit messages.

Using the National Park Service symbol of "Smoky Bear" as a model, a small group of fine arts students might undertake to develop a series of small symbols with appropriate messages that would emphasize student responsibility for their school environment.

PURPOSE: To have individuals express their personal attitude toward pollution through creative art forms.

LEVEL: K-3
4-6
7-9
10-12

SUBJECT: Fine Arts

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: I-10 Aesthetic Considerations--cultural opportunity.

REFERENCE: Hershev, John T. et al. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: This activity gives students a chance to become more aware of the environmental crisis through their art and pass this awareness to others. Students of all ages and all kinds of artistic abilities can participate.

The activity may be initiated by having the class visit a scene of actual pollution. There, and at other sites, the students may collect the trash or symbols of the pollution; some of these may be included in the actual making of the art form. Posters, collages, mobiles, sculptures, and other art forms may be used; creative dance, plays, and songs should also be considered. The art forms should be displayed in various areas of the school and community.

PURPOSE: To create natural prints through a dry photographic process.

LEVEL: 4-6
7-9

SUBJECT: Fine Arts
Science

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: I Aesthetic Considerations.

REFERENCE: "Teacher Resource Booklet," Project ECO, Ames Community Schools, Ames, Iowa 50010.

ACTIVITY: The dry photographic process in this activity uses light sensitive paper which, when developed, darkens where light has hit the paper. The finished print has light objects on a dark background.

In making the print, the student may create a photograph with natural materials which he has collected and pressed. The same process may also be used to make a photographic collection of pressed leaves or flowers. A plant key could be developed with these prints.

To make prints, you will need the following materials:

Diazo, Driprint, or Ozalid paper	8-1/2 X 11 (*)
Glass sheet	8-1/2 X 11 (*)
Heavy cardboard	8-1/2 X 11 (*)
Large-mouth gallon jar with lid	
Household ammonia	
Masking tape	

(*) Any size will do as long as the paper, glass, and cardboard are approximately the same size.

Cover the edges of the glass with masking tape for safety and to form a border on the finished print. The tape also affords a place for the fingers to hold the assembly during exposure to the sun without showing a print of the fingers as well as of the leaf or other material being printed.

In the bottom of the gallon jar, place a tissue or paper towel saturated but not soaked with ammonia. Actually, enough ammonia to fill the jar with fumes is all that is needed. You may wish to place a piece of crumpled wire or coat hanger in the bottom of the jar so the photographic paper will not actually come in contact with the ammonia.

Find a shaded or semi-dark place to work. Place a piece of Diazo paper--yellow or glossy side up--on the cardboard. On this yellow or glossy side, arrange your leaf or other materials in an appropriate design. Cover and flatten the materials against the paper with the glass sheet.

Turn this assembly--glass side up--and expose it to strong sunlight (or artificial light) for a few seconds until the paper turns white. Remove from sunlight and place the exposed paper in the jar containing the ammonia fumes and close the lid.

The ammonia fumes will quickly develop the print. If development is uneven, remove the print from the jar and reverse the paper so the undeveloped portion will be toward the bottom of the jar where the ammonia fumes are more concentrated. Remove the paper from the jar when print has developed evenly.

The print is then completed. Mount and label the prints and place them out for display.

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GRADE LEVEL 10 - 12

Activities

Science	3
Science-Mathematics	1
Science-Social Studies	4
Science-Language Arts	1
Mathematics-Social Studies	2
Social Studies	15
Social Studies-Science	9
Social Studies-Mathematics	2
Social Studies-Mathematics-Science	1
Language Arts	3
Language Arts-Social Studies	1
Fine Arts	1

PURPOSE: To appreciate the role of salt marshes as a marine resource.

LEVEL: 10-12

SUBJECT: Science

CONCEPT: I-4 If any environment, one component - like space, water, air, or food - may become a limiting factor.

PROBLEM: IV-11 Eco-Community Relationships--effects of water quality on ecosystem.

ACTIVITY: View with the class the 17-minute color-sound film "Green Marsh and Blue Waters" available from Time-Life Films, 53rd and 6th Avenue, New York, New York 10024. The film overviews the role of marshes in determining the fertility of the sea; how pollution, landfills, and "developments" affect the ecosystem.

Follow-up the film showing by discussing the "price" of disrupting marsh-lands. Who benefits. Who loses? Is this a matter of importance to people who live far inland from coastal waters? Why or why not? Is it desirable and/or feasible to develop an ecologically oriented plan for future management of coastal marshes? Who should do it?

Consider also recent (1974) advertisements of oil companies that report fishing has improved greatly around oil derricks built on the continental shelf. Are the messages of such ads and the message of the film complimentary or contradictory? Are marshes endangered by off-shore drilling? What evidence can be cited to support a yes or no answer?

PURPOSE: To observe the effects of sulfur dioxide on certain material.

LEVEL: 10-12

SUBJECT: Science

CONCEPT: IV-1 Organisms and environments are in constant change.

PROBLEM: II-3 Health Considerations--air quality.

REFERENCE: "A Supplementary Program for Environmental Education--Science," Project I-C-E, 1927 Main Street, Green Bay, WI 54301.

ACTIVITY: Use a chemistry laboratory manual of instruction in producing sulfur dioxide (SO_2) from $S + O_2$ or $Na_2SO_3 + H_2SO_4$. Follow the procedure carefully and observe all safety rules. Collect several bottles of pure SO_2.

Using the bottles of pure SO_2, immerse such materials as plant tissue, animal tissue, natural fibers, and synthetic fibers into the gas. Observe changes in these materials after an hour and after 24 hours.

Locate local industries which produce SO_2 as a by-product. Ask representatives of these groups to discuss with the class how the company tries to eliminate SO_2 from its discharge.

PURPOSE: To observe and determine the amount of water released during transpiration.

LEVEL: 7-9
10-12

SUBJECT: Science

CONCEPT: I-1 Living things are interdependent with one another.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: Hershey, John T. et al. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: Have the students select a tree with low-hanging branches; enclose a leaf or small branch in a clean, dry plastic bag, having weighed the bag beforehand. Tie the bag shut with string and seal the closure with vaseline. After an appropriate amount of time, collect the bags and quantitatively determine the amount of water transpired by using a sensitive balance or scales and subtracting the dry weight of the plastic bags. Students can compare different transpiration between night and day, leaves in shade and direct sunlight, and leaves of different sizes: perhaps a method of measuring the amount of water transpired by a tree in a 24-hour period can be determined. The same activity may be performed with potted plants indoors where more factors--amount of light, availability of water--can be controlled.

Advanced students may wish to set up the apparatus shown on the following page. By filling the system completely with water, the quantity of water used by a plant at various intervals can be measured as water moves down the pipette. Be sure where the plant stem came out of the stopper, the hole is sealed with cotton and vaseline. The upper end of the pipette is open; if the activity is to be carried on for a long period of time, a film of oil may be placed on top of the water in the pipette to prevent evaporation.

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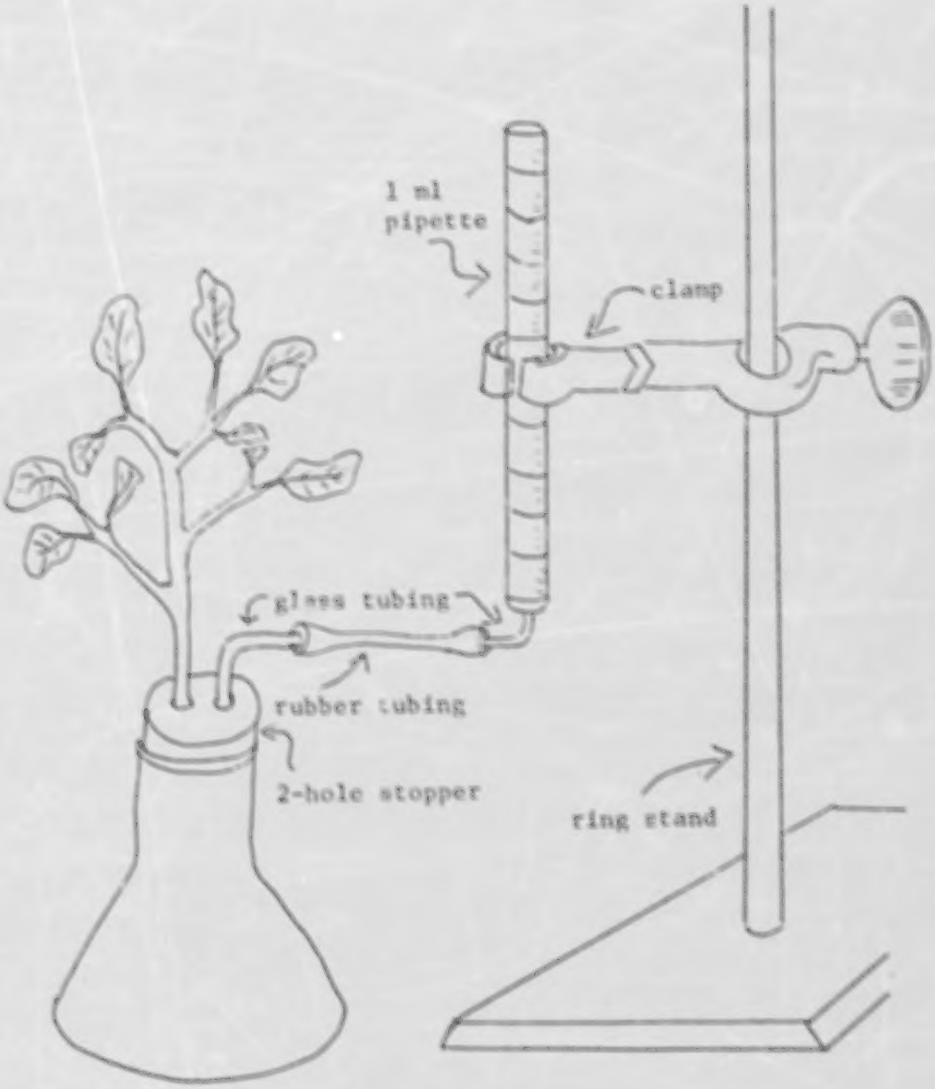
1 ml
pipette
clamp
glass tubing
rubber tubing
2-hole stopper
ring stand

Apparatus for Measuring Transpiration

PURPOSE: To obtain an estimate of an animal population.

LEVEL: 7-9
10-12

SUBJECT: Science
Mathematics

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-6 Eco-Community Relationships--population studies.

REFERENCE: Allegheny County Outdoor School, Cumberland, Maryland 21502.

ACTIVITY: When dealing with animal populations which can be easily trapped, an accurate estimate of the population can be obtained by using a ratio method. An example of how to use this method is given below with grasshoppers being the population under study.

Select a grassy field where grasshoppers can be collected with sweep nets. Have the students collect as many grasshoppers as they can in the time available; at least 50 should be collected, but the larger the number, the more accurate the results will be.

Mark each grasshopper collected by placing a dab of nail polish or paint on its thorax. Count and release back into the field the marked grasshoppers.

On the following day, again collect as many grasshoppers as possible from the same field. Count the total number of grasshoppers collected on the second day. Then count the number of those collected which are marked with paint.

Now you can estimate the total population of grasshoppers in the area with the following ratio:

$$\frac{P}{C_1} = \frac{C_2}{M}$$

P = Total Population.
C_1 = Number caught and marked on first day.
C_2 = Total number caught on second day.
M = Number of marked grasshoppers caught on second day.

PURPOSE: To understand the energy subsidies required to produce various food.

LEVEL: 7-9
10-12

SUBJECT: Science
Social Studies

CONCEPT: I-1 Living things are interdependent with one another and their environment.

II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

IV-4 Eco-Community Relationships--energy production.

IV-12 Eco-Community Relationships--effects of humans on ecosystem.

REFERENCE: Energy: Sources, Use, and Role in Human Affairs. Carol and John Steinhart, Duxbury Press, North Scituate, Mass. (1974).

ACTIVITY: Review with the class the general concept that energy (human, animal, chemical, etc.) is required to produce food crops. Have them speculate regarding which foods require much "energy" to produce. Are these the foods that also give much energy when man uses them?

After exploratory discussion along such lines make available for class study the figure shown below. What does it show? What crops or types of agriculture require least energy? Are such crops and types found predominately in the U.S.A. or elsewhere? Why?

What types of food require the biggest energy subsidy? Why? What does the figure indicate to be the relationship between specific food costs and energy costs? Might this relationship result in future changes in American eating habits? What might they be?

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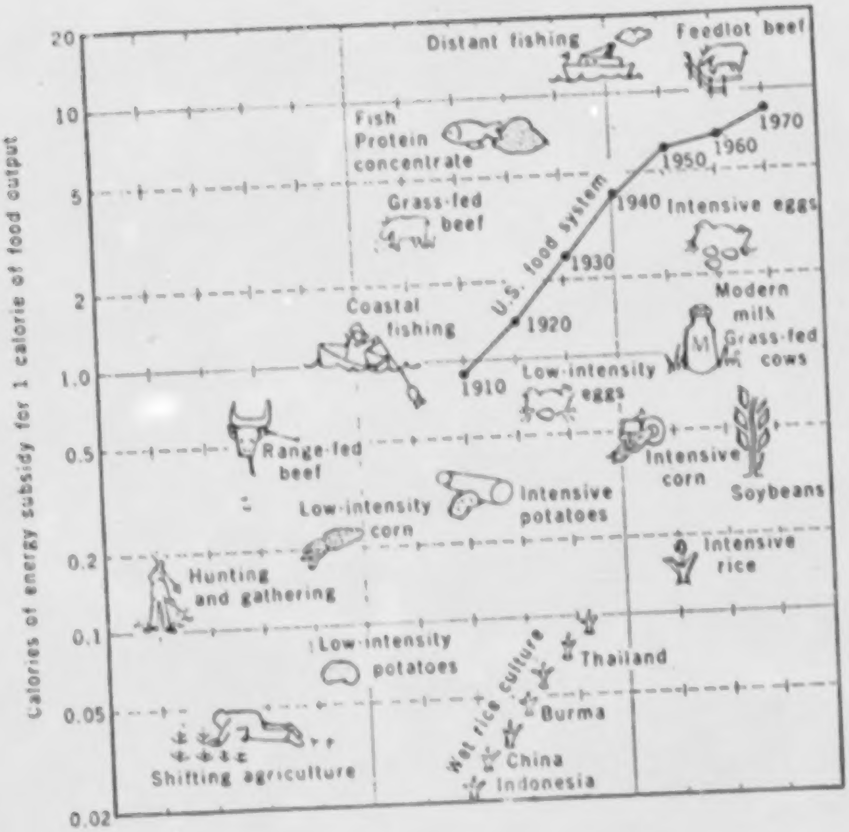

Energy subsidies for various food crops. The energy history of the U.S. food system is shown for comparison.

PURPOSE: To become more aware of the beneficial results of selective breeding of animals and plants.

LEVEL: 7-9
10-12

SUBJECT: Science
Social Studies

CONCEPT: III-4 Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: IV-7 Eco-Community Relationships--species control (non-human).

REFERENCE: Man and His World. Contemporary Social Science Curriculum, Silver-Burdett.

ACTIVITY: Involve the class in identifying the foods most commonly used to feed the world's population. The list would undoubtedly include wheat, corn, rice, soybeans, various vegetables, fruits, milk, beef, pork, chicken, fish, and other foods.

Raise with the class questions concerning the historical origins of the plants and animals on which we are so dependent. Did the wheat plant always look like it does today? Do we have different types of wheat for different climates? Do we now get larger yields per acre? Why? Similar research can be done and reported on other plants.

Other students might research the many kinds of dairy and beef cattle that have been developed through selective breeding from a common bovine ancestor. How much, for example, have we been able to increase milk production per animal?

Are there limits to increasing food production by these methods?

Specialists from colleges of agriculture or a trip to an agricultural experiment station might be useful in introducing or culminating such a study.

PURPOSE: To become aware of chemical dangers in the environment.

LEVEL: 7-9
10-12

SUBJECT: Science
Social Studies

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: II-2, 3, 5 Health Considerations--radioactivity; air quality; food quality.
III-2 Genetic Considerations--chemicals.

ACTIVITY: Develop with the class a list of "pollutants" that Americans now ingest through nose, mouth, or skin. The list should include such things as sulphur dioxide, carbon monoxide, cancer-causing hydrocarbons, lead compounds, DDT, aerosol can substances, radiation sources such as Strontium 90 and Iodine 131. Ask students to do independent or small group research on some of the pollutants. Where do they come from? Why were they developed? Are they inevitable and necessary in a modern technological society? Does the good associated with these substances outweigh the bad?

Involve the class in discussing the importance of the findings secured by student library research on selected pollutants. Discuss the concern of many scientists about the possibility of genetic damage resulting from chemical and radioactive pollution of our bodies. React to the statement, "Our generation may have performed a cruel experiment on succeeding generations."

PURPOSE: To become aware of sediment carried from various types of ground covers and the problems associated with stream and reservoir sedimentation.

LEVEL: 7-9
10-12

SUBJECT: Science
Social Studies

CONCEPT: III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: "Teaching Soil and Water Conservation," U.S. Department of Agriculture, Publication PA-341.

ACTIVITY: Secure several tall, narrow bottles, such as those in which olives are sold. After a heavy rain, have different students collect a bottle full of water from different streams. One stream, for example, might come from a cultivated field, another from a good pasture, another from a woodland, another from a housing project or other development under construction. Label each sample, place side by side in the classroom and observe the amount of sediment that settles out during a few days.

Encourage the class to discuss the importance of topsoil to the farmer. What harm is done by heavy sedimentation of streams? How is storage capacity of reservoirs influenced? How are fish affected? Are floods related to stream sedimentation? How does sedimentation cost the taxpayer? What can be done by individuals or government agencies to reduce the problem?

PURPOSE: To become more aware of ecological interactions.

LEVEL: 4-6
7-9
10-12

SUBJECT: Science
Language Arts

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: *Teachers Curriculum Guide For Field Ecology*. Brevard County (Florida) School System.

ACTIVITY: In a basically natural setting such as a park, wooded area, meadow, or on the bank of a stream, ask a student to sit quietly *alone* for 20-30 minutes.

During this time, he should be instructed to do something such as:

1. Listen for sounds and record in a notebook *all* sounds that he hears. He should also attempt to identify the source of all sounds heard.
2. Record all smells that he can sense. Try, again, to identify the source of each.
3. Record all that is seen. While sitting quietly he may see interesting activities of birds, insects, and larger animals. Suggest that students look for examples of interactions between animals or between animals and plants.

After returning to the classroom, ask the students to write a paper in which they summarize or create a story about what they heard, smelled, and saw. Did they like the experience? Why, or why not? What traits are necessary to be a good naturalist?

The activity might be repeated in a basically man-made environment such as along a city street, in the foyer of a large building, or on a bus. Again, the students could be asked to record what they see, hear, or smell and look for interactions between organisms or between organisms and their environment.

After returning to the classroom, students could write summary or reaction papers and evaluate the experience. They might also be asked to explain why they preferred studying the natural or man-made environment.

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PURPOSE: To review some problems associated with petroleum distribution in the world.

LEVEL:
7-9
10-12

SUBJECT:
Mathematics
Social Studies

CONCEPT: III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

ACTIVITY: Involve the class in identifying the countries they regard as leaders in developing modern technology. Develop with the class a second list of countries they have learned or believe to be the largest petroleum exporting countries. Finally, ask them to identify the two countries in the world that have the largest populations.

Present, on a worksheet or by use of an overhead transparency, oil production and population data included in this activity. Challenge students to prepare, individually or in small work groups, graphs or charts that will show dramatically the disparity among countries in terms of total and per capita production.

Discuss the problems associated with this condition. What solutions are possible or likely? Is this a problem of greatest concern in the U.S.A. or in some other countries? Why?

Country	Oil Production* (42-gallon barrels)	Population*
United States	3,455,000,000	210,000,000
USSR	2,895,000,000	250,000,000
West Germany	51,000,000	62,000,000
France	11,000,000	52,000,000
Japan	5,000,000	107,000,000
United Kingdom	607,000	56,000,000
Saudi Arabia	2,202,000,000	8,000,000
Iran	1,840,000,000	31,000,000
Kuwait	1,201,000,000	910,000
Venezuela	1,178,000,000	11,000,000
Libya	819,000,000	2,000,000
India	57,000,000	560,000,000
China	216,000,000	800,000,000

*Data from 1974 World Almanac.

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PURPOSE: To become aware of the rapid growth of American cities.

LEVEL: 7-9
10-12

SUBJECT: Mathematics
Social Studies

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: V-1 Psychological and Behavioral Considerations--crowding.

ACTIVITY: From some book of facts such as the World Almanac, secure and present to the class the growth pattern, since 1900, of 10 of the largest American cities.

Ask students individually, or in groups of two or three, to graph the rate of growth of these cities. Follow up the actual graphing with discussion-speculation as to why the rates vary so widely. Also try to explain factors responsible for the growth of each city. Does there appear to be a nation-wide trend? Why? What is their projection for future growth of American cities?

City	1900 Population*	1970 Population*
New York	3,400,000	7,900,000
Chicago	1,700,000	3,400,000
Los Angeles	100,000	2,800,000
Philadelphia	1,300,000	2,000,000
Detroit	300,000	1,500,000
Houston	45,000	1,200,000
Baltimore	500,000	900,000
Dallas	43,000	800,000
Washington	300,000	800,000
Indianapolis	200,000	700,000

*Rounded to nearest 100,000.

PURPOSE: To examine how the automobile dictates city land use.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: I-8 Aesthetic Considerations--city planning and convenience.

I-9 Aesthetic Considerations--traffic control.

IV-5 Eco-Community Relationships--urban planning

REFERENCE: Your Environment and What You Can Do About It. A Citizens Guide. Richard Saltonstall, Jr., Walker and Company, 1970.

ACTIVITY: Review with the class readily accessible data such as the following cited in the above reference:

1. An ordinary highway interchange uses approximately ten acres of land.
2. A large cloverleaf interchange such as found in Atlanta and many other cities uses over 100 acres of land.
3. Approximately 300 square feet of maneuvering and parking space is required for every car that commutes into the city.
4. Highways, streets, and parking lots take up to 70% of the land surface in many cities.

Discuss the desirability of developing more park areas and safe-walking pedestrian malls in the downtown area. Would such developments be preferable to more highway construction? Why or why not? Why are such developments slow in coming?

Ask class members to interview a cross section of adults including some business owners to determine how they feel about such potential downtown changes that might convert some present streets to pedestrian malls and/or small parks.

What persons support and oppose the idea? Why? Do Students agree with the arguments advanced by the persons interviewed?

PURPOSE: To investigate the transportation problem in an urban area.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: IV-5 Eco-Community Relationships--urban planning.

REFERENCE: "Teaching Materials for Environmental Education," Forest Service--USDA, U.S. Government Printing Office, Washington, D.C. 20402.

ACTIVITY: This is a group activity for investigating one of several factors affecting the community environment. Under the heading "Information Needed," have the group list all the things it needs to know to investigate the problem of transportation or traffic congestion such as how many cars, where do the cars go, where do the cars come from, what routes are used, how many passengers, etc. After the list of "information needed" has been completed, start two new lists beside the first--"How to Collect" and "How to Record." For each item of information needed, determine the best way (or ways) to obtain that information and the form in which the information should be recorded. For example, one entry might look like this:

How many cars? -- survey, visual count -- graph
Where cars go -- questionnaire -- map location

Have the group work in teams to gather appropriate information in the manner suggested. Each team should consider cause-effect relationships, alternative solutions to the problem, additional sources of information, what social and political decision-making processes are available, etc.

After the investigations are completed, have the group consider the total problem and needs for the future. The group should identify appropriate community action which would motivate the community consideration of the problem.

PURPOSE: To investigate an urban environment.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: IV-5 Eco-Community Relationships--urban planning.

REFERENCE: "Teaching Materials for Environmental Education," Forest Service--USDA, U.S. Government Printing Office, Washington, D.C. 20402.

ACTIVITY: This activity has students identify and investigate factors affecting the quality of the environment in the local community. Student groups will investigate the urban environment and collect information that will tell them about the livability, functions, needs, and problems of the area. They will also develop procedures to obtain the information necessary to their study. The depth to which the students probe in this activity will depend upon the time and interest of the teacher and the students.

Have the students identify the component parts of an urban environment. Allow the students to work in small groups and list the factors which affect the quality of the community environment. Then group the items into categories and label each category. It would be helpful if a map of the area could be supplied to each student. After the groups have compiled their categories, have them report to the class and list each category on the board. Some categories may be human factors, land use, transportation, housing, commercial, utilities, and so on. List each category as the group reports it; consolidate the lists to incorporate duplicate categories under a single heading.

Have each group of students identify an area of the community to study. Using their maps, let the groups draw boundary lines around the area they will investigate; have them consider where the boundaries should be placed.

Each group should now construct a method for investigating the broad categories determined by the class for their selected area. Let the groups devise their own plans and conduct their own investigations. They should consider such methods as visual observation, opinion polls, surveys, user counts of facilities, inverviewing municipal leaders, checking city records, etc.

(The study of the transportation problem in an urban area is included elsewhere in this volume as an example of investigation of a particular problem.)

After collecting and studying the data, the groups could submit oral class reports on their findings. Guides for changes in an area could be developed by the class and reviewed by local officials.

An alternative to this approach would be to have each group investigate only one of the factors affecting the urban environment for the whole area.

PURPOSE: To understand more fully the advantages and disadvantages of city living.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

REFERENCE: Man and His World. Contemporary Social Science Curriculum, Silver-Burdett.

ACTIVITY: Develop with the class a list of the reasons why people move from rural areas to the city. The list will include such factors as better jobs, better schools, better health care, more excitement, more entertainment, and others. Are these expectations of rural families moving to the city actually realized? View some selected films on problems of city life and engage the class in discussion of the lifestyle of various socio-economic groups that live in cities. Are jobs better in cities? Are schools better? Is better health care available? And so forth. Is it possible that cities are "great places to visit," but terrible places to live in? Is it possible that poverty is worse in big cities than in rural areas?

If cities are growing too large for their own good, what can be done to correct this condition? What can be done by individuals, cities, states, or national governments?

PURPOSE: To examine suburban development plans.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: III-3 Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: IV-2 Eco-Community Relationships--land use.

ACTIVITY: Consider with heavy input from the class the advantages and disadvantages of the two plans of subdivision layout pictured below.

After the discussion ask class members to summarize why the cluster plan is used so seldom.

Invite a real estate developer, home builder, or mortgage loan official to come to the class and discuss the advantages and disadvantages of the two plans as he views them. If a class visit is impractical have several members of the class agree to interview developers, builders, and other concerned persons and get their reactions to the alternative plans. Do their judgments agree with those made by class members. If not, why?

PURPOSE: To find how man's demands on the environment bring about change.

LEVEL:
4-6
7-9
10-12

SUBJECT: Social Studies

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: IV-5 Eco-Community Relationships--urban planning.

REFERENCE: "Elementary Science Guide," Division of Elementary Education, State Department of Education, Richmond, VA 23216.

ACTIVITY: Have the class visit several areas in the city where the human population is one the increase. Observe the changes in land use, the number of new buildings, the number of apartments versus the number of single family dwellings, the amount and type of materials being used. What kinds of demands are made upon the environment in relation to the life needs of the residents? Will more shopping areas be needed? Is the land available for shopping centers? How will traffic patterns in the area be affected? Check with local officials about increasing water and power consumption, solid waste disposal problems, and land erosion. Are any plans being made to maintain a natural or open-space area? Is this important?

Develop alternate solutions to the problems of the increased population and hypothesize the results of the solution.

If you had control of the land in the area before the sudden influx of people, how would you change the way it has developed?

PURPOSE: To understand more fully the factors that influence the distribution of population in a state or nation.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: I-1 Living things are interdependent with one another and their environment.

PROBLEM: V-2 Psychological and Behavioral Considerations--social aspects.

REFERENCE: Environmental Pollution Education - Curriculum Resource Guide. St. Joseph's Calumet College, East Chicago, Indiana.

ACTIVITY: Develop, through discussion with students in the class, a list of factors that determine where people live. Starting with their own families, the list will likely include such things as:

1. Where work is available.
2. Where our family has lived for several generations.
3. Where good education is offered.
4. Where recreation is available.
5. Where the climate and weather are good.
6. (Students can suggest other reasons.)

Using the factors identified, have the class explain the enormous size of cities such as New York, Chicago, Los Angeles, and the small size of cities or villages in your area.

Discussion may evolve regarding the "optimum size" of a city. Can cities get too large? Why, or why not? What, if anything, might be done to discourage growth of already enormous metropolitan areas?

PURPOSE: To examine the water budget of a small watershed and its implications for land use policy.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: IV-2 Eco-Community Relationships--land use.

REFERENCE: Hershey, John T. *et al*. *A Curriculum Activities Guide to Water Pollution and Environmental Studies*. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: Select a watershed which the students can visit. Have the students determine the physical characteristics--stream flow, amount of precipitation, water level variations, chemical composition of water, and others--at various points along the watershed. The students should map out the present use of the watershed and contact municipal, county, and state officials to ascertain future plans for the land in the watershed. As the culminating activity, the class should present its ideas on how the watershed could best be developed for future use. Local officials might be invited to attend this final presentation.

PURPOSE: To examine some beliefs commonly held by American people.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: V-2 Psychological and Behavioral Considerations--social aspects.

REFERENCE: Man and Environment. Miami-Dade Junior College, 11011 S.W. 104 Street, Miami, Florida 32210.

ACTIVITY: Present to the class a list such as the following of commonly held beliefs or "myths" regarding Technology in America:

1. What's good for business is good for the country.
2. The oceans will feed us.
3. Technology will solve all problems.
4. Decentralized government is the answer to environmental problems.
5. Man is apart from his environment.
6. More government will better solve environmental problems.
7. Increased consumption is related to quality of living.
8. Automation makes more jobs.

Ask students individually, or in small groups, to select one of the above (or another they might propose) and study the soundness of the belief through library research or through interviews with appropriate resource persons. Also request that data be secured by questionnaire or interview from a sizeable number of persons to determine the extent to which the belief is or is not accepted.

Have the findings reported to the class for further discussion.

PURPOSE:	To consider policy and advertizing of the petroleum industry.
LEVEL:	7-9 10-12
SUBJECT:	Social Studies
CONCEPT:	II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.
PROBLEM:	IV-3 Eco-Community Relationships--natural resource use.
REFERENCE:	Environmental Conservation. A Report of the National Petroleum Council's Committee on Environmental Conservation--The Oil and Gas Industries, 1625 K Street, N.W., Washington, D.C. 20006, 1971.
ACTIVITY:	Involve the class in a very careful analysis of the position taken by the National Petroleum Council in the Summary-Conclusion statement quoted below. What assumptions are made? Do the conclusions follow logically? Are assumptions and conclusions clear or ambiguous? Cite specific examples.

Ask a few interested students to collect over a period of a few weeks from magazine sources such as Time, Newsweek, National Geographic and comparable publications the advertisements of the major petroleum and gas companies. Have students compare the message of current advertisements with the 1971 position. Do they stress the same things? If not what accounts for the change? Are the advertisements convincing or alienating to you? Why?

SUMMARY CONCLUSION

It is the conclusion of the National Petroleum Council, an industry advisory body to the Secretary of the Interior representing virtually the entire American oil and gas industries, that these industries are conscious of their significant responsibilities for environmental conservation and are sincerely dedicated to a continuing and effective approach to the solutions to those environmental problems which lie within their purview.

The oil and gas industries are well aware of the environmental problems resulting from the conduct of their various operations of production, refining, storage, transportation and marketing of products, and also outside these industries, from the use of their products. Real progress has been made in defining these problems and developing solutions to them, but, nevertheless, problems remain. Continuing progress will be required to improve standards and to develop more advanced technology and better operating practices and equipment to achieve improved environmental quality.

The oil and gas industries face a requirement to provide to the society of which they are a part vital energy in a manner consistent with environmental conservation, recognizing that the costs involved are those of society. We are confident that these industries will continue to do their part, including full cooperation with government and with the general public which they serve, so that the requisite environmental standards can be developed and met, consistent with providing the nation with its necessary energy.

PURPOSE: To survey recreational preferences and opportunities.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: I-11 Aesthetic Considerations--recreational facilities.

V-3 Psychological and Behavioral Considerations--cultural considerations.

ACTIVITY: Develop with the class a list of recreational activities that rely primarily on the national environment such as fishing, hiking, hunting, canoeing, and mountaineering. Develop another list that uses primarily a man-made environment; i.e. bowling, reading, attending movies, basketball, and joyriding in automobiles. Try to make each list comprehensive enough to include all activities commonly engaged in by class students and their families.

Using a questionnaire developed from these lists ask each class member to interview at least two young, two middle aged, and two older persons to find out (1) their preferences, if any, of recreational activities from each list and (2) their actual participation in the activities of their choice.

After collecting data discuss differences between preferences and participation. Are some too costly? Are some facilities inadequate? Are some deemed too dangerous?

Invite an official of the city or county recreation board or comparable agency to come to class and react to what has been found. Ask him to review the plans being made to provide additional facilities and programs. Review with him what might be done to help by groups such as the class. If possible, conclude the study with some kind of service activity in which class members actually improve some aspect of the community's recreation program.

PURPOSE: To sense relationships between recreational activities and energy usage.

LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

REFERENCE: Energy and Man's Environment. Elementary Through Secondary Interdisciplinary Activity Guide, Education/Research Systems, Inc., 2121 Fifth Avenue, Seattle, Washington 98121.

ACTIVITY: Ask the students to work in groups of three and develop a chart in which they (1) list all of the common recreational activities they can think of, (2) name the kinds of energy needed to engage in each recreational activity, (3) judge the extent to which each activity is healthful or harmful, (4) estimate how popular each recreational activity is in their community, state and nation, and (5) the extent of their personal interest in each activity. Ask each group to be creative in designing the chart or table so it can include easily all of the judgments requested.

Summarize the material developed by the small groups in a large matrix on the chalkboard, or large sheet of paper, and discuss the results.

Do spectator sports such as football require much energy? What kind? How would they rate a major sporting event such as the Indianapolis 500-Mile Auto Race? How would they compare tent camping with vacationing in a mobile home? What is their judgment about the desirability of sporting arenas such as the Astrodome?

Is the general pattern of recreational activity in America geared to high energy use? If so, what can and/or should be done about it?

PURPOSE: To use building structures to interpret the cultural history of the area around the school.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: IV-5 Eco-Community Relationships--urban planning.

REFERENCE: "Some 'Around the School Yard' Activities," U.S. Forest Service, Portland, Oregon.

ACTIVITY: Have the students inventory building structures within a given distance of the school or between the school and the students' homes. It may be possible to draw or obtain a map of the area; locate students' homes on the map and the buildings studied.

Develop a classification system for types of buildings--shape, roof shape and type, materials used in construction, etc.

Develop a classification for age of buildings. Map the vacant buildings in the area and determine how long they have been out of use. What was their original use? What factors caused the building to become vacant?

Make an inventory of fences in the area. What material was used to build them? What types of fence are they?

From your inventories, can shifts in population be observed? Is the business in the area changing? What factors are affecting growth in the area? How are traffic patterns affecting the area?

PURPOSE: To introduce the governmental framework for recognizing and solving ecological problems.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: III-4 Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: V-2 Psychological and Behavioral Considerations--social aspects.

REFERENCE: Hershey, John T. *et al*. *A Curriculum Activities Guide to Water Pollution and Environmental Studies*. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: This activity is to introduce students to governmental structure on a state and local level. As a result of this activity, the student should know where to go in his local or state government to deal with environmental problems. The students should develop a schematic diagram to display the governmental office breakdown.

This activity may be done in conjunction with the study of a pollution problem and the collection of field data to demonstrate the existence of that problem; or a particular pollution problem may be pointed out by the teacher and data collected through news reports and articles. Once the problem is identified, students should obtain information concerning state laws and agencies which are concerned with such a problem. Local lawyers and elected officials may be invited to discuss the matter with the students. Student groups can be organized to consider areas such as the relationship of federal and local agencies; the operative efficiency of state commissions; state, federal, and local laws dealing with pollution; the social aspect of pollution; and many more.

PURPOSE: To understand the problems inherent in making political decisions about environmental matters.

LEVEL: 7-9
10-12

SUBJECT: Social Studies

CONCEPT: II-2 The relationships between man and the natural environment are mediated by his culture.

PROBLEM: I-4 Aesthetic Considerations--litter.

REFERENCE: John Sauer, Columbus, Ohio, Junior High School Teacher.

ACTIVITY: Create with the class a role-playing situation in which a subcommittee of the State Legislature has been designated to write legislation to prohibit the use of non-returnable beverage bottles.

Ask for volunteers (or draft) students to represent, as lobbyists, "pressure groups" that have a special interest in the proposed bill. These might include such groups as supermarket owners, bottle manufacturers, can manufacturers, landfill operators, ecologists, and "concerned citizens."

Ask the lobbyists to prepare a 3-5 minute presentation regarding their views on the proposed legislation to the subcommittee of 5-7 students. The legislators, of course, should have the opportunity to question lobbyists about their statements or positions.

The next day, the subcommittee should meet again in front of the class to draft the proposed bill. When the bill is drafted, involve class members in considering the arguments advanced by the lobbyists and the "fairness" of the draft proposal. What do they believe personally about the need for legislation in this area?

PURPOSE: To understand the importance of natural marshes and floodplains.

LEVEL: 7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

REFERENCE: _Teachers Curriculum Guide for Field Ecology_. Center for Environmental Education, Brevard County (Fla.) School Board, Cocoa, Florida 32922

ACTIVITY: Discuss with the class the concept that "natural marshes and floodplains act as biological waste treatment complexes that absorb and utilize excess watershed nutrients." Review the recent tendency to (1) eliminate marshes by filling (2) to speed stream flow by channelizing, and (3) to use dams and levees to guard against flooding on natural floodplains and to use such land for real estate developments.

Why should we be concerned with elimination of marshes? Should the power to drain a marsh or channelize a stream rest only with the owner of the land? Why or why not? Should real estate developments be permitted on known floodplains? Should government "disaster loans" be available to cover flood losses for homes in such locations?

After class discussion on such questions invite a proponent of channelization such as a spokesman from the U.S. Army engineers, Department of Agriculture, or a real estate developer to come to class and discuss his position on appropriate questions developed by the class.

PURPOSE: To understand that deserts may be man-made.

LEVEL: 7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: IV-4 Man has been a factor affecting plant and animal succession and environmental processes.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

ACTIVITY: During a study of the geography and cultures of Asia Minor and North Africa raise questions with the class about what happened to the great civilizations that once flourished there. What happened to the once very productive Tigrus-Euphrates valley? What happened to agricultural lands surrounding ancient Carthage? What happened to the land when the Biblical Cedars of Lebanon were cut ruthlessly?

Involve the class in researching the importance of forests in moderating temperature and in holding soil on steep hillsides. Review what happens to irrigation projects when waterways become heavily silted. Raise questions about the damage to ground cover caused by overgrazing with sheep, goats, and cattle.

What evidence can be found to support the contention that deserts can be caused by man as well as by climatic changes? Is it possible to create deserts in the U.S.A.? Where? How? What can/should be done about this problem?

PURPOSE: To determine the effects a town or industry has on a given waterway.

LEVEL: 10-12

SUBJECT: Social Studies
Science

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

REFERENCE: Hershey, John T. *et al*. *A Curriculum Activities Guide to Water Pollution and Environmental Studies*. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: Have the students collect water samples from a minimum of three locations on a river--above, immediately below, and a considerable distance below a town or industry located on the river.

Using any of the several commercial water-testing kits (e.g. Hach, Delta, or LaMotte kits), the students should determine the chemical properties of the water samples.

The students may wish to consider such concepts as which dissolved solids are associated with industrial or urban waste, how the waste materials are affecting the life in the river, how long (distance) it takes the river to "recover" from the effluent, and so on. Students may be interested in investigating the cause of each pollutant and in working toward finding ways to eliminate the source.

PURPOSE: To study the nature and extent of world health problems.

LEVEL: 10-12

SUBJECT: Social Studies
Science

CONCEPT: I-4 In any environment, one component--like space, water, air, or food--may become a limiting factor.

PROBLEM: II-1 Health Considerations--disease control.

REFERENCE: "Strand IV - Environmental and Community Health," Grades 10-12, Bureau of Secondary Curricular Materials, State Department of Education, Albany, NY 12224.

ACTIVITY: This activity may be developed to any depth depending upon the interest and time available for the students.

Have the class list some of the health problems of the world which they feel require international effort and cooperation. Gather information on world helth problems; a good place to start would be the World Health Organization (WHO). A catalog of WHO publications may be obtained from the American Public Health Association, World Health Documents, 1740 Broadway, New York, NY 10019.

After some background reading, have students select a country to study in terms of health problems. (An alternative plan would be to have the students select one health problem to study in depth.) In the study of each country, consider size, topography, cultural traditions, and socio-economic characteristics. Compare the health status in the advanced regions with those of developing regions, paying particular attention to the relationship between standards of living and education levels.

Compare the activities of each of the following agencies: HOPE, CARE, and MEDICO as they relate to the health of children in the world. Do the functions of these organizations overlap? Do they supplement each other? Do they compete with each other?

PURPOSE: To investigate changes in food production and preparation.

LEVEL: 7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: II-5 Health Considerations--food quality - pesticides, additives

V-3 Psychological and Behavioral Considerations--cultural considerations

REFERENCE: The Ecological Citizen. Dirck Van Sickle, harper and Row, 1971.

ACTIVITY: Review with the class their understanding of recent changes in food production and preparation. They will (or should) identify recent developments such as (1) tremendous growth in use of frozen foods, (2) boil-in-the-bag items, (3) freeze dried foods, (4) packaged foods such as snacks that need no preparation, and (5) single portion products. A list of major changes in production patterns such as (1) enormous "chicken farms" where hundreds of thousands of broilers are raised under artifical light, (2) tremendous feed-lots where beef-cattle are fattened for market (3) use of antibiotics in animal feed and (4) use of hormones to stimulate animal growth should also be identified.

Ask two or three students to work together to collect information about one of the recent developments. Through reading, field study, or interview consider questions such as: Has the development reduced the cost of food? Has it improved food quality? Who has benefitted from the development? Who, if anyone, has been harmed? Have any of the developments changed their family style of living? If the development likely to continue or accelerate in the years ahead? Why or why not?

Interviews with specialists in animal science or food merchandising should prove to be an interesting part of the study.

PURPOSE: To understand the energy demands of fast-food operations.

LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: IV-4 Eco-Community Relationships--energy production.

V-3 Psychological and Behavioral Considerations--cultural considerations.

ACTIVITY: Involve the class in trying to explain the phenomonal growth of the fast-food industry in the U.S.A. during the past decade. Help students understand that large national operations such as McDonald's, Kentucky Fried Chicken, Arthur Treachers, Burger King, Arby's as well as large locally known drive-in eating places were unknown a few years ago. If feasible, arrange to take the class on an early morning field trip to such a place and have someone who knows the operation well explain how they can produce their meals so quickly. Give particular attention to the energy using equipment found.

Do they use frozen food? Do they have much refrigeration equipment? What other power appliances or equipment are found? Does it take more energy to prepare food in such a place than it does at home? Are such places trying to conserve energy? Why or why not?

Consider also the amount of energy used by people to get from homes to fast-food eating places. Have such places noticed any slacking-off of business as a result of increased gasoline costs? Do they anticipate a growing problem in this regard?

Projecting ahead what does the class believe will happen in the fast-food industry during the next 10-20 years. Will such growth as noticed in recent years continue or even accelerate? What assumptions and/or facts have they taken into account in reaching their prediction?

PURPOSE: To understand the value of using plant proteins.

LEVEL: 7-9
10-12

SUBJECT: Social Studies
Science (in Home Economics)

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: IV-1 Eco-Community Relationships--ecological considerations.

REFERENCE: Jane Keathley, Columbus, Ohio, Senior High School Teacher.

ACTIVITY: Use the groupings normally used for food preparation activities. Each group should plan and prepare a main dish using commercially prepared vegetable protein meat substitutes that the teacher has obtained and mixed so that it is ready for use in casseroles, meat loaf, chili, or other appropriate dishes. Have the students prepare their dishes and evaluate the results with the assumption they are using "real meat."

The following day, review with the class the importance of protein in the diet. Involve them in understanding why animal protein must always, in terms of food chain loss, be more expensive than vegetable protein. Show the class boxes of meat substitutes such as those prepared by Creamettes or Worthington Foods and ask how many would like to use such products rather than meat. After some discussion, and likely rejection of the idea, inform them that they had actually used the materials in their previous food preparation.

Why do Americans prefer meat? Why do the Japanese and many other countries use so much vegetable protein? How much cheaper is vegetable protein? Why? Are there advantages to vegetable protein other than economy?

The discussion might be followed up by another food preparation when the students know that they are using, for example, a ground beef substitute to prepare spaghetti sauce for use in class. Is the sauce tasty? Does it really make much difference whether you use meat or the substitute?

PURPOSE: To become aware of the international struggle for oceanic resources.

LEVEL: 10-12

SUBJECT: Social Studies
Science

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.
III-1 The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

REFERENCE: The Curious Entanglement of Law, Politics, and the Environment - Political/Legal Resource Unit prepared by Center for Environmental Education, Brevard County (Fla.) School Board, Cocoa, Florida 32922.

ACTIVITY: Involve the students in listing areas of concern about oceanic resources. Undoubtedly, items such as fishing, whaling, off-shore production of oil and gas, mining for minerals, and using ocean tankers or freighters as a cheap mode of transportation will be cited.

Ask groups of students to do library research in contemporary magazines, governmental publications, or United Nations reports on the nature and scope of disagreement among various countries on the items. Why is there a consistent difference in positions taken by "developed" versus "developing" countries? Which positions do the students personally support? Why?

Should use of oceanic resources be attempted by private corporations, national governments, the U.N., or some other agency? Why? How critical are oceanic resources for the future of mankind?

PURPOSE: To become aware of organized group efforts to work on environmental problems.

LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies
Science

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: IV-12 Eco-Community Relationships--effects of humans on ecosystem.

ACTIVITY: Ask for individuals or very small groups of students to take responsibility for drafting letters to organizations such as those listed below. Request information concerning purposes of the organization, size of membership, membership requirements, outstanding accomplishments, and other information available to publicize the organization.

Ask two or three students to review carefully the material received and to report their findings to the class. What kind of person joins the group? Is it a nationwide group? Is there a local chapter? Has the group been successful. What evidence can be cited? Would the group be interested in having students join?

If possible have a local member of such a group talk to the class to review their concerns and successes.

The Sierra Club
1050 Mills Tower
220 Bush Street
San Francisco, California 94104

Friends of Animals
11 West 60th Street
New York, New York 10023

The Wilderness Society
1901 Pennsylvania Avenue., N.W.
Washington, D.C. 20006

Friends of the Earth
72 Jane Street
New York, New York 10014

Zero Population Growth
1346 Connecticut Avenue, N.W.
Washington, D.C. 20036

Scientists Institute for Public Information
30 East 68th Street
New York, New York 10021

Planned Parenthood-World Population
515 Madison Avenue
New York, New York 10022

National Audubon Society
950 Third Avenue
New York, New York 10022

The Izaak Walton League
1841 South River Road
Des Plaines, Illinois 60016

The Conservation Foundation
1717 Massachusetts Avenue, N.W.
Suite 300
Washington, D.C. 20036

The Mother Earth News
P. O. Box 38
Madison, Ohio 44057

PURPOSE: To study human ecology and epidemiology.

LEVEL: 10-12

SUBJECT: Social Studies
Mathematics

CONCEPT: I-3 An organism is the product of its heredity and environment.

PROBLEM: II-1 Health Considerations--disease control.
III-3 Genetic Considerations--medical treatment.

REFERENCE: "Strand IV - Ecology and Epidemiology of Health," Grades 10-12, Bureau of Secondary Curricular Development, State Education Department, Albany, NY 12224.

ACTIVITY: This investigation involves the use of population statistics to trace the effects of various infections and communicable diseases of human populations. A major source of information is Vital Statistics of the U.S. which may be obtained from the Superintendent of Documents, Washington, D.C.

Epidemiology is the study of factors and conditions which determine occurrence and distribution of health, disease, defect, disability, and death among groups of people. Diseases such as typhoid fever, TB, diphtheria, smallpox, whooping cough, and so on, were at one time the primary concern of epidemiology but with most of these controlled in the U.S., the study is being centered on new problems such as accidents, heart disease, cancer, inherited disease, and others.

Discuss with the students what diseases are "reportable" and how vital statistics data is collected. Your county health department should be able to supply you with a monthly vital statistics summary. Have students organize into groups to study the available data and organize it into meaninfgul categories.

Examine causes of death through history, comparing shifts in death rate from specific causes; for example, the death rate due to heart disease in 1900 was 137 per 100,000 population, while in 1967 it was 436.5 per 100,000 population. Speculate as to reasons of shifts in death rate.

Make a list of diseases and defects which are known to be solely hereditary, are suspected to be hereditary, are strongly controlled by the environment. How does the changing environment affect each of these?

Use current data on venereal diseases, smoking and health, and drug abuse to analyze and hypothesize causes of these problems. Project possible solutions.

PURPOSE: To examine surface runoff and its relation to the hydrologic cycle.

LEVEL: 7-9
10-12

SUBJECT: Social Studies
Mathematics

CONCEPT: IV-1 Organisms and environments are in constant change.

PROBLEM: IV-2 Eco-Community Relationships--land use.

REFERENCE: Hershey, John T. et al. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: To examine surface runoff, select sites with a variety of slopes and substrata. Determine an area of 20 cm square and excavate a shallow trench on the downhill edge to collect the runoff; a dustpan or tray may be used as the collecting device. Measure the angle of the slope with a clinometer, Brunton compass, or homemade device. Pour one liter of water into a No. 10 can with holes (to simulate rain) while holding it over the delineated area. Collect and filter the surface runoff; measure the volume to get percent of runoff. Wait five minutes and repeat the process to find the effect of increased soil moisture.

Select and delineate an adjacent area or similar site with the same slope; repeat the process using a different intensity.

PURPOSE: To understand energy use in the United States food system.

LEVEL: 10-12

SUBJECT: Social Studies
Mathematics
Science

CONCEPT: II-3 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

IV-5 Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: IV-3 Eco-Community Relationships--natural resource use.

REFERENCE: Energy: Sources, Use, and Role in Human Affairs. Carol and John Steinhart, Duxbury Press, North Scituate, Mass. (1974).

ACTIVITY: Make available to all students in the class the table shown below. Develop graphs that show the pattern of growth in energy usage from 1940 to 1970. Ask students to find specific examples of new machinery or new processes or new cultural patterns that account for much of the increased energy usage in several of the components listed in the table.

Engage the class in discussing what the changing pattern of energy use means in terms of food costs to the consumer. Ask for evidence to support the contention that the change has been good or bad. Do they predict the trend from 1940-1970 will continue? Why or why not? What suggestions can they offer to reduce energy usage in the three major categories?

Do they believe the U.S. food system is a good "model" to export to developing countries? Why or why not?

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Table 1. Energy use in the United States food system. All values are multiplied by 10^{12} kcal.

Component	1940	1947	1950	1954	1958	1960	1964	1968	1970	References
				On farm						
Fuel (direct use)	70.0	136.0	158.0	172.8	179.0	188.0	213.9	226.0	232.0	*(13-15)*
Electricity	0.7	32.0	32.9	40.0	44.0	46.1	50.0	57.3	63.8	*(14, 16)*
Fertilizer	12.4	19.5	24.0	30.6	32.2	41.0	60.0	87.0	94.0	*(14, 17)*
Agricultural steel	1.6	2.0	2.7	2.5	2.0	1.7	2.5	2.4	2.0	*(14, 18)*
Farm machinery	9.0	34.7	30.0	29.5	50.2	52.0	60.0	75.0	80.0	*(14, 19)*
Tractors	12.8	25.0	30.8	23.6	16.4	11.8	20.0	20.5	19.3	*(20)*
Irrigation	18.0	22.8	25.0	29.6	32.5	33.3	34.1	34.8	35.0	*(21)*
Subtotal	124.5	272.0	303.4	328.6	356.3	373.9	440.5	503.0	526.1	
				Processing industry						
Food processing industry	147.0	177.5	192.0	211.5	212.6	224.0	249.0	295.0	308.0	*(13, 14, 22)*
Food processing machinery	0.7	5.7	5.0	4.9	4.9	5.0	6.0	6.0	6.0	*(23)*
Paper packaging	8.5	14.8	17.0	20.0	26.0	28.0	31.0	35.7	38.0	*(24)*
Glass containers	14.0	25.7	26.0	27.0	30.2	31.0	34.0	41.9	47.0	*(25)*
Steel cans and aluminum	38.0	55.8	62.0	73.7	85.4	86.0	91.0	112.2	122.0	*(26)*
Transport (fuel)	49.6	86.1	102.0	122.3	140.2	153.3	184.0	226.6	246.9	*(27)*
Trucks and trailers (manufacture)	28.0	42.0	49.5	47.0	43.0	44.2	61.0	70.2	74.0	*(28)*
Subtotal	285.8	407.6	453.5	506.4	542.3	571.5	656.0	787.6	841.9	
				Commercial and home						
Commercial refrigeration and cooking	121.0	141.0	150.0	161.0	176.0	186.2	209.0	241.0	263.0	*(13, 29)*
Refrigeration machinery (home and commercial)	10.0	24.0	25.0	27.5	29.4	32.0	40.0	56.0	61.0	*(14, 30)*
Home refrigeration and cooking	144.2	184.0	202.3	228.0	257.0	276.6	345.0	433.9	480.0	*(13, 29)*
Subtotal	275.2	349.0	377.3	416.5	462.4	494.8	594.0	730.9	804.0	
Grand total	685.5	1028.6	1134.2	1251.5	1361.0	1440.2	1690.5	2021.5	2172.0	

PURPOSE: To examine problems associated with use of recreational vehicles.

LEVEL: 7-9
10-12

SUBJECT: Language Arts

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: I-11 Aesthetic Considerations--recreational facilities.

REFERENCE: Energy and Man's Environment - Elementary Through Secondary Interdisciplinary Activity Guide. Education/Research Systems, Inc., 2121 Fifth Avenue, Seattle, Washington 98121.

ACTIVITY: Ask three small groups of students to prepare large poster board exhibits on (1) snowmobiles, (2) sand dune buggies, and (3) trail bikes. Suggest that they become knowledgeable about the cost of the vehicles, places where they are used in the state and nation, and the state laws governing operation of the machines.

Engage the class in discussion about the propriety of using these vehicles in view of their impact on the environment and the energy shortage. What useful purpose is served? What harm is done? Is this a "private" matter or one of community or state concern? What changes, if any, would they suggest be made in the manufacturing or use of such vehicles?

After a period or so of discussion on such questions, ask each student to develop, in writing, his position for or against the use of such vehicles in general and/or under different conditions.

PURPOSE: To help students critically read articles about the environment.

LEVEL: 7-9
10-12

SUBJECT: Language Arts

CONCEPT: III-3 Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: V-2 Psychological and Behavioral Considerations--social aspects.

REFERENCE: Hershey, John T. et al. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: Select several environmental articles which use statistics as a basis for persuading the reader to take a particular viewpoint. The articles may be from newspapers or magazines; all should reflect the reading ability and scientific background of the students. Articles taking opposing viewpoints would be of particular interest.

While reading the articles, the students should consider such questions as:

How reliable is the information in the article?

What is the source of the data? Is that source reliable?

Is pertinent data omitted?

Does the author stray from the subject?

After reading the article(s), have the students critique the material, backing up their views with examples. The students may wish to rewrite the material in an acceptable form. The same type of exercise can be done with written advertisements or television commercials.

A book which may be of use in this type of activity is How To Lie With Statistics by Darrell Huff (W. W. Norton & Co., 1954). The book is also available in paperback.

PURPOSE:	To use student interest in ecology to develop language facility in French and German.
LEVEL:	7-9 10-12
SUBJECT:	Language Arts
CONCEPT:	I-1 Living things are interdependent with one another and their environment.
PROBLEM:	IV-1 Eco-Community Relationships--ecological considerations.
REFERENCE:	Minnesota State Department of Education, Capitol Square Building, St. Paul, Minnesota 55101; Wisconsin Department of Public Instruction, 126 Langdon Street, Madison, Wisconsin 53702.
ACTIVITY:	Several state Departments of Education have produced curricular materials pertaining to ecology but written in a modern foreign language. Minnesota has produced such materials in French and German; these same materials are also available from the state of Wisconsin.

The Ecology Packets contain cartoons, activities, articles (one in German was originally written by Ralph Nader), plays, and much more--all written in a modern foreign language. New vocabulary is introduced as ecological concepts are taught. The student is made aware that ecology must be a world-wide concern as environmental action and problems in France and Germany are discussed.

PURPOSE: To examine what we owe and can give to other cultures.

LEVEL: 10-12

SUBJECT: Language Arts
Social Studies

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and life-ways that are transmitted to its progeny.

PROBLEM: V-3 Psychological and Behavioral Considerations--cultural considerations.

REFERENCE: Can Man Care For The Earth? Edited by Richard L. Heiss and Noel F. McInnis, Abingdon Press, 1971.

ACTIVITY: Use the following article written in 1937 as a springboard for discussion about the extent to which cultures "borrow" from each other. Ask students to write creatively about contributions from the culture of the United States that might be viewed as useful and/or important by people living on Earth in the year 2500. Have some students read their essays to the class and defend, in discussion, their choices of what is likely to be important enough to stand the test of time.

ONE HUNDRED PER CENT AMERICAN - Ralph Linton

American Mercury, 1937

There can be no question about the average American's Americanism or his desire to preserve this precious heritage at all costs. Nevertheless, some insidious foreign ideas have already wormed their way into his civilization without his realizing what was going on. Thus dawn finds the unsuspecting patriot garbed in pajamas, a garment of East Indian origin; and lying in a bed built on a pattern which originated in either Persia or Asia Minor. He is muffed to the ears in un-American materials; cotton, first domesticated in India; linen, domesticated in the Near East; wool from an animal native to Asia Minor; or silk whose uses were first discovered by the Chinese. All these substances have been transformed into cloth by methods invented in Southwestern Asia. If the weather is cold enough he may even be sleeping under an eiderdown quilt invented in Scandinavia.

On awakening he glances at the clock, a medieval European invention, uses one potent Latin word in abbreviated form, rises in haste, and goes to the bathroom. Here, if he stops to think about it, he must feel himself in the presence of a great American institution: he will have heard stories of both the quality and frequency of foreign plumbing and will know that in no other country does the average man perform his ablutions in the midst of such splendor. But the insidious foreign influence pursues him even here. Glass was invented by the ancient Egyptians, the use of glazed tiles for floors and walls in the Near East, porcelain in China and the art of enameling on metal by Mediterranean artisans of the Bronze Age. Even his bathtub and toilet are but slightly modified copies of Roman originals. The only purely American contribution to the ensemble is the steam radiator, against which our patriot very briefly and unintentionally places his posterior.

In this bathroom, the American washes with soap invented by the ancient Gauls. Next he cleans his teeth, a subversive European practice which did not invade America until the latter part of the eighteenth century. He then shaves, a masochistic rite first developed by the heathen priests of ancient Egypt and Sumer. The process is made less of a penance by the fact that his razor is of steel, an iron-carbon alloy discovered in either India or Turkestan. Lastly he dries himself on a Turkish towel.

Returning to the bedroom, the unconscious victim of un-American practices removes his clothes from a chair, invented in the Near East; and proceeds to dress. He puts on close-fitting tailored garments whose form derived from the skin clothing of the ancient nomad of the Asiatic steppes and fastens them with buttons whose prototypes appeared in Europe at the close of the Stone Age. This costume is appropriate enough for outdoor exercise in a cold climate, but is quite unsuited to American summers, steam-heated houses, and Pullmans. Nevertheless, foreign ideas and habits hold the unfortunate man in thrall even when common sense tells him that the authentically American costume of gee string and moccasins would be far more comfortable. He puts on his feet stiff coverings made from hide prepared by a process invented in ancient Egypt and cut to a pattern which can be traced back to ancient Greece, and makes sure that they are properly polished, also a Greek idea. Lastly, he ties about his neck a strip of bright-colored cloth which is a vestigial survival of the shoulder shawls worn by seventh-century Croats. He gives himself a final appraisal in the mirror, an old Mediterranean invention, and goes downstairs to eat breakfast.

Here a whole new series of foreign things confronts him. His food and drink are placed before him in pottery vessels, the popular name of which--china--is sufficient evidence of their origin. His fork is a medieval Italian invention and his spoon a copy of a Roman original. He will usually begin the meal with coffee, an Abyssinian plant first discovered by the Arabs. The American is quite likely to need it to dispel the morning-after effects of overindulgence in fermented drinks, invented in the Near East, or distilled ones, invented by the alchemists of medieval Europe. Whereas the Arabs took their coffee straight, he will probably sweeten it with sugar, discovered in India; and dilute it with cream, both the domestication of cattle and the technique of milking having originated in Asia Minor.

If our patriot is old-fashioned enough to adhere to the so-called American breakfast, his coffee will be accompanied by an orange, domesticated in the Mediterranean region, cantaloupe domesticated in Persia, or grapes domesticated in Asia Minor. He will follow this with a bowl of cereal made from grain domesticated in the Near East and prepared by methods also invented there. From this he will go on to waffles, a Scandinavian invention, with plenty of butter, originally a Near-Eastern cosmetic. As a side dish he may have the egg of a bird domesticated in Southeastern Asia or strips of the flesh of an animal domesticated in the same region, which have been salted and smoked by a process invented in Northern Europe.

Breakfast over, he places upon his head a molded piece of felt, invented by the nomads of Eastern Asia, and if it looks like rain, puts on outer shoes of rubber, discovered by the ancient Mexicans, and takes an umbrella, invented in India. He then sprints for his train--the train, not the sprinting, being an English invention. At the station he pauses for a moment to buy a newspaper, paying for it with coins invented in ancient Lydia. Once aboard he settles back to inhale the fumes of a cigarette invented in Mexico, or a cigar invented in Brazil. Meanwhile, he reads the news of the day, imprinted in characters invented in Germany upon a material invented in China. As he scans the latest editorial pointing out the dire results to our institutions of accepting foreign ideas, he will not fail to thank a Hebrew God in an Indo-European language that he is one hundred per cent (decimal system invented by the Greeks) American (from Americus Vespucci, Italian geographer).

PURPOSE: To have individuals express their personal attitude toward pollution through creative art forms.

LEVEL:
K-3
4-6
7-9
10-12

SUBJECT: Fine Arts

CONCEPT: II-1 The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: I-10 Aesthetic Considerations--cultural opportunity.

REFERENCE: Hershey, John T. et al. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Tilton School Water Pollution Program, Tilton, New Hampshire (1970).

ACTIVITY: This activity gives students a chance to become more aware of the environmental crisis through their art and pass this awareness to others. Students of all ages and all kinds of artistic abilities can participate.

The activity may be initiated by having the class visit a scene of actual pollution. There, and at other sites, the students may collect the trash or symbols of the pollution; some of these may be included in the actual making of the art form. Posters, collages, mobiles, sculptures, and other art forms may be used; creative dance, plays, and songs should also be considered. The art forms should be displayed in various areas of the school and community.